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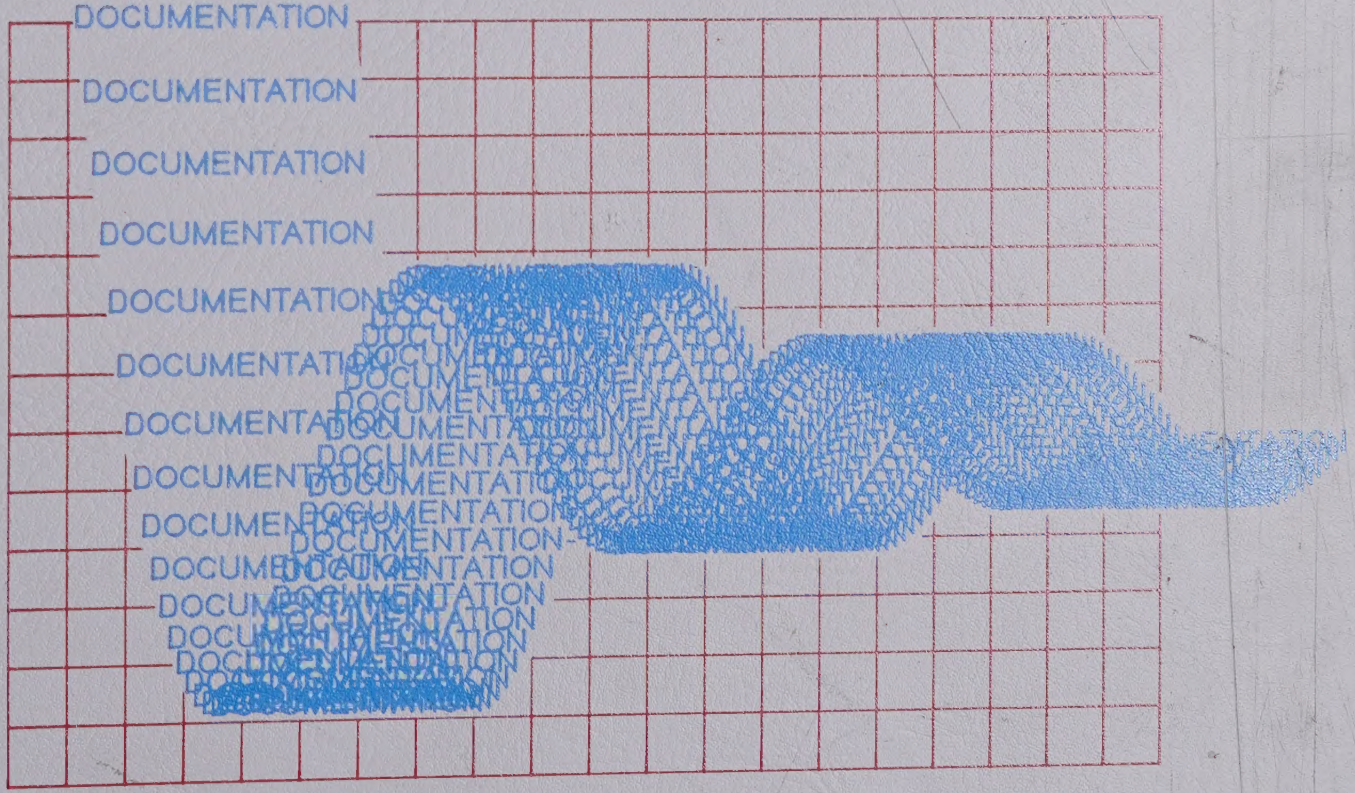

ROHDE & SCHWARZ
Rohde & Schwarz UK Ltd • Ancells Business Park • Fleet • Hampshire GU13 8UZ
Telephone (Customer Enquiries) +44 (0) 1252 811377 • (Service Helpline) +44 (0) 1252 811484 • Fax +44 (0) 1252 811447

ADVICE OF DESPATCH/PACKING LIST

Assessment Services
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F.A.O. Mr. T. Fisher.

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Despatch No: 2443

Carrier: Data Express

Despatch Date: 27.01.98

Our Order No: N/A

Your Order Ref:

Order Date:

In communications please quote our order and despatch note number.

ITEM	DESCRIPTION/SERIAL NO	QTY	CHECKED BY
1	ES-K1F Software Update Dongle No: 2161	1	

Customer Copy/Admin Copy/Stores Copy/Finance & Admin Dept Copy
Signature:

For and on behalf of Rohde & Schwarz UK Ltd

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*****************************************************************************
*                                                                           *
*          ADDITIONAL INFORMATION FOR EMI SOFTWARE                          *
*                                                                           *
*                    ES-K1                                                  *
*                                                                           *
*                  Version 1.50                                             *
*                                                                           *
*****************************************************************************
```

Please read this file carefully before installing or starting the software !

System Requirements:

Minimum Hardware Configuration
- PC CPU 486 / 33 MHz
- 8 MB RAM
- >10 MB free harddisk space
- GPIB card: PC2/2A

Recommended Hardware Configuration
- PC CPU 586/Pentium / 133 MHz
- 32 MB RAM
- fast Graphics Card (1-2 MB Video RAM)
- >30 MB free harddisk space
- Backup System (e.g. Tape Streamer; weekly backups)
- GPIB card: AT-GPIB/TNT or PCI-GPIB
- Printers: HP LaserJet 3/4/5 , HP DeskJet 5xx/6xx

Supported Platforms (Windows / GPIB hardware):

Windows 3.1/3.11
(National Instruments driver versions 2.7 or 2.7.1)
- PC2/2A
- AT-GPIB
- AT-GPIB/TNT [PnP] [+]
- PCMCIA

Windows 95
(National Instruments driver version 1.2 or higher)
- PC2/2A
- AT-GPIB/TNT [PnP] [+]
- PCI-GPIB
- PCMCIA [+]

Windows 95
(National Instruments driver for Win3.1/3.11 version 2.7.1

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https://archive.org/details/manualsplus_00848

plus compatibility release version 1.2)
PC2/2A
AT-GPIB

Windows NT
only in demo mode (no GPIB access)!
a future upgrade of the ES-K1 will also fully support Windows NT

The latest drivers for the National Instrumnets GPIB cards
can be downloaded from the Internet:
http://www.natinst.com

Installation Notes:

If there's no GPIB card installed and therefore no driver (GPIB.DLL) present, a messagebox might be shown each time when the application starts, indicating a system error because of the missing driver; this error message can be ignored (press 'Close' or 'OK' when the dialogue has come up). Under Windows 95 it might take a while until the application comes up.

Before using the software in combination with the GPIB bus, make sure that the configuration of your GPIB card is correct (as described also in the manual).
To verify the configuration, start the configuration program
- either named WIBCONF.EXE, available after installation of the GPIB software for Windows
- or an extra icon belonging to the tools of the control panel
or go through the device settings/properties ('advanced' settings) for the GPIB card (Windows 95 device manager).
Also run any diagnostic tools to detect any hardware/software conflicts.

Enter the menus/dialogs for the settings of the card (referred to as GPIB0) and edit the following parameters if necessary and available:

* Enable Auto Serial Poll ---> NO

* Base I/O Address ---> default address (e.g. 02C0)
(value must correspond to the settings of the referring jumpers; change to another address if the default address is used by another software driver, e.g. a network card or a second GPIB card)

* DMA Channel ---> NONE
(jumpers on the card may be set different, but will not be evaluated)

* Interrupt Level ---> default level (e.g. 11)
(value must correspond to the settings of the referring jumpers; change to another level if the default address is used by another software driver, e.g. a network card or a second GPIB card)

If these parameters seem to be correct, leave the configuration program and select OK if asked for saving any modifications.

In case of an update (1.40 => 1.50) the configuration of the older version should be saved to the disk in advance ('Save configuration...' in the file menu).
The same is true if a receiver option (ES-K1x) is to be added to an existing version 1.50.
When the installation is complete then this configuration should be loaded into the version 1.50 to go on with the individual settings instead of any default settings.

The installation can be started either from the Windows Program Manager or from the Windows File Manager (Win95: Explorer):
Start the file SETUP.EXE on disk no. 1.
If an option disk is available then select 'Installation'. Otherwise select either 'Update' or 'Demo Installation'. For an easy installation go on with the default settings of the dialogs.
'Update' searches all local hard drives for an older version, so this selection won't work if no older version can be found.
The total length of the installation path should NOT exceed 15 characters.

Once an 'Update' has been done, then the option disk can be created, thus enabling to make another installation at a later time without the need to have an older version installed (e.g. when you want to move to another PC):
Go to the EXECUTE directory which is a subdirectory inside the ES-K1 installation path. Start the batch procedure OPT_DISK.BAT and insert a formatted floppy disk into drive A:.

For Windows 3.1/3.11 it is strongly recommended to have the DOS disk cache tool 'Smart Drive' (SMARTDRV.EXE) installed.

Minimum firmware Versions of the Test Equipment:

(* = needed with GPIB/TNT cards)

ES-K10
- ESHS 10: 2.12 (2.19 if available*)
- ESHS 20/30: 3.09 (3.11 if available*)
- ESVS 10: 2.12 (2.19 if available*)
- ESVS 20/30: 3.09 (3.11 if available*)
- ESVD: 2.12 (2.19 if available*)
- ESPC: 1.03 (1.06 if available*)
- ESCS 30: 1.05

ES-K11
- ESS: 1.06 (1.08 if available*)

ES-K12
- ESAI: 2.75/2.75/2.75
- ESBI: 2.75/2.75/2.75
- ESMI: 2.75/2.75/2.75

ES-K13
- ESH3: 2.7
- ESVP: 1.85/1.85

ES-K14
- ESH3: 2.7
- ESVP: 1.85/1.85
- EZM: 2.17/2.04

ES-K15
- FSA: 2.75/2.75/2.75
- FSB: 2.75/2.75/2.75
- FSM: 2.75/2.75/2.75

ES-K30
- HCC: 1.06

ES-K31
- HCC: 1.06

ES-K32
- EMCO 1050: n.a.
- EMCO 1060: n.a.
- EMCO 1090: n.a.
- EMCO 2090: n.a.

ES-K33
- HD 100: n.a.

ES-K34
- HD 100: n.a.

Remarks:

1.) After installation, the standard device drivers for

- ESH2-Z5 (4-line network)
- ESH3-Z5 (2-line network)
- HM020 (triple loop antenna)
- RSU (relay matrix PSU/RSU)
- SUPER-RSU (controls a combination of up to four RSUs)
- LPTIO (reads from or writes to pins of a parallel port; this driver is not available through an "update")

have been installed. For use in the ES-K1, they have to be declared in the DEVICE CONFIGURATION (Options menu), but you should preferably start with the configuration provided with the installation of any receiver option (ES-K1x).

2.) When the application is started for the first time, a user group and a user (system manager) have to be defined and a password has to be provided. Note that only a system manager can modify the user list. The handling of the strings for user group, user and password is case sensitive !

3.) In case of an update (1.40 => 1.50):
Now the configuration from the older version should be loaded into the version 1.50 to keep on with the individual settings instead of any default settings.

4.) The STANDARD DATA consists of the general data, supplied by R&S, that have to be loaded either through the installation procedure or with the 'Import' function (file menu) from the application.
It includes:

- Standard Scripts (mainscript files + subscript files)
- Script Parameters (included with mainscript files)
- Limit Lines
- Probe Transducers
- System Transducers
- Frequency Lists

Those data may already be preinstalled but can also be retrieved at a later time through the IMPORT function (after ES-K1 has been started) from the following directory:

<installation path>\IMP\STD\

Example:
Import from 'C:\ES-K1.150\IMP\STD'

Besides there are directories that hold the receiver specific data
- Scan Tables
- Sweep Tables

They are enclosed in the corresponding subdirectories.
Example:
Import ESXI (ES-K12) scan tables from path 'C:\ES-K1.150\IMP\K12\ESXI'

Most standards/specs include different variations (EUT classes, measurement distances etc.). The delivered standard data cover for each standard a typical case. In all other cases, the delivered settings have to be copied and adapted.

The STANDARD DATA of Version 1.50 provide the following tests:

- EMI voltage test on mains

- EMI power test with absorbing clamp
- EMI electric field strength test with broadband antennas
- EMI magnetic field strength test with loop antennas
- EMI MIL-STD 461/462C test (conducted and radiated)
- EMI MIL test (MIL-STD 461/462D, DEF STAN, GAM, VG)
- cable calibration (cable loss, preamplifiers, etc.)
- probe calibration (antenna sensitivity, etc.)
- normalised site attenuation (CISPR 16, CISPR 22)
- EMI voltage test on antenna terminals (EN 55013)
- azimuth chart test (polar diagram)
- overview test (marker selection)
- semi-interactive test with special user dialog

5.) It is strongly recommended to regularly move measurement results and other (test) result files into backup databases. This helps a lot to keep the database in a easily manageable size.
Besides it makes sense to have regular backups of the whole harddisk so that any accidental damages to the data won't be too harmful to the system.

Known Problems:

1.) To get DDE working, the software ES-K1 must have been started. Currently it is not possible to start the ES-K1 from another application (e.g. MS Word) because the working directory will not match (Windows problem).

2.) On some Compaq PCs the application fails to come up correctly. In those cases a file VISTA.TAF somewhere in the DOS path causes that conflict. As a remedy, this file has to be renamed (e.g. VISTA.OLD).

3.) On some PCs the levels on the lines of the parallel port may not be sufficient to simultaneously drive the hardlock key and a printer, caused by a power saving or bidirectional operation mode. In that case the PC setup for the parallel port has to be set to a STANDARD mode/configuration.

Support:

If your local dealer cannot provide support, refer to:

ROHDE & SCHWARZ Support Center
Phone: +49-180-5124242 (08.00-17.00 MET / Voice Mail)
Fax: +49-4129-3777
E-Mail: customersupport@rsd.de
73400.1310@compuserve.com

If possible, use the file SW_REP.TXT to send a software report (page 1) via e-mail or as a fax: Fill out all (!) fields (except 'Internal Notes') and mention any details that might affect the topic. Use a separate software report forch each further topic.

General Information:

ROHDE & SCHWARZ, Munich
http://www.rsd.de

in the USA:
Tektronix, Inc.
http://www.tek.com

****

* ES-K1 *

****

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
* *
* ES-K10 *
****

Note:

1.) After installation, the drivers for the test receivers

- ESHS (firmware version 2.12 (2.19 if available*) for ESHS 10 and
  firmware version 3.09 (3.11 if available*) for ESHS 20/30)
- ESVS (firmware version 2.12 (2.19 if available*) for ESVS 10 and
  firmware version 3.09 (3.11 if available*) for ESVS 20/30)
- ESVD (firmware version 2.12 (2.19 if available*))
- ESPC (firmware version 1.03 (1.06 if available*))
- ESCS (firmware version 1.03 for ESCS 30)

(* = needed with GPIB/TNT cards)

have been installed. For use in the ES-K1, they have to
be declared in the DEVICE CONFIGURATION.

NOTE:
If you are UPDATING from version 1.40 then you will NOT be able to
define the drivers for ESPC and ESCS 30 in your device configuration!
In this case you will also need an update of your option files.
Send a fax to
ROHDE & SCHWARZ, department 1ESP (+49-89-4129-3055)
with the following information:
- your ES-K1 Version
- your hardlock key no. (4 digits)
- your mail address or preferably your e-mail address
You will get an update of your ES-K10 option files (3 files) along
with an explanation of what to do.

2.) The receiver specific data,

- scan tables

are enclosed in the corresponding directories:

for the ESHS and ESVS:
<installation path>\IMP\K10\ESHS_VS\

for the ESVD:
<installation path>\IMP\K10\ESVD\

for the ESPC:
<installation path>\IMP\K10\ESPC\

for the ESCS:
<installation path>\IMP\K10\ESCS\

They have to be IMPORTED from the application, e.g.:
import scan tables from path C:\ES_K1.150\IMP\K10\ESHS_VS

Known Bugs:

1.) Fast scan with ESCS 30: When using an IF bandwidth of 200 Hz then the frequencies you get might not be totally exact.

2.) When using a GPIB card with the National Instruments TNT chip then you should try to get an up-to-date firmware version for your receiver (the firmware version given in brackets, see above).

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K11 *
****

Note:

1.) After installation, the drivers for the test receiver

- ESS (firmware version 1.06 (1.08 if available))

has been installed. For use in the ES-K1, they have to be declared in the DEVICE CONFIGURATION.

2.) The receiver specific data,

- scan tables

are enclosed in the corresponding directory:

for the ESS:
<installation path>\IMP\K11\ESS\

They have to be IMPORTED from the application, e.g.:
import scan tables from path C:\ES_K1.150\IMP\K11\ESS

Known Bugs:

1.) When using a GPIB card with the National Instruments TNT chip then you should try to get an up-to-date firmware version for your receiver (the firmware version given in brackets, see above).

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K12 *
****

Note:

1.) After installation, the drivers for the EMI receivers/analyzers

- ESAI, ESBI, ESMI (firmware version 2.75/2.75/2.75)

have been installed. For use in the ES-K1, they have to be declared in the DEVICE CONFIGURATION.

Because of the similarity within this receiver family, these receivers are adressed with the common sybolical name "ESXI".

2.) The receiver specific data,

- scan tables
- sweep tables

are enclosed in the corresponding directories:

for the ESXI:
<installation path>\IMP\K12\ESXI\

They have to be IMPORTED from the application, e.g.:
import scan tables from path C:\ES_K1.150\IMP\K12\ESXI

Known Bugs:

1.) The tracking generator can't be used below 100 kHz when performing scan or single measurements. Sweeps are OK.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K13 *
****

Note:

1.) After installation, the drivers for the test receivers

- ESH3 (firmware version 2.7)
- ESVP (firmware version 1.85/1.85)

have been installed. For use in the ES-K1, they have to be declared in the DEVICE CONFIGURATION.

2.) The receiver specific data,

- scan tables

are enclosed in the corresponding directories:

for the ESH3 and ESVP:
<installation path>\IMP\K13\ESH3_VP\

They have to be IMPORTED from the application, e.g.:
import scan tables from path C:\ES_K1.150\IMP\K13\ESH3_VP

Known Bugs:

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
* *
* ES-K14 *
****

Note:

1.) After installation, the drivers for the test receivers

- ESH3 (firmware version 2.7)
- ESVP (firmware version 1.85/1.85)
- EZM (firmware version 2.17/2.04)

have been installed. For use in the ES-K1, they have to be declared in the DEVICE CONFIGURATION.

2.) The receiver specific data,

- scan tables (not for EZM)
- sweep tables (EZM only)

are enclosed in the corresponding directories:

for the ESH3 and ESVP:
<installation path>\IMP\K14\ESH3_VP\

for the EZM:
<installation path>\IMP\K14\EZM\

They have to be IMPORTED from the application, e.g.:
import scan tables from path C:\ES_K1.150\IMP\K14\ESH3_VP

3.) To perform sweeps with the EZM+ESH3 and/or the EZM+ESVP check the following conditions:

- both the receiver(s) and the EZM have to be configured in the device configuration

- the EZM has to be defined as 'Talker/Listener' (EZM Setup Menu)

- the test receivers' GPIB addresses have to match with the corresponding addresses in the EZM's setup menu

- the EZM and the ESH3 have to be linked (see EZM manual for details):
ESH3 75 MHz IF output ==> EZM 75 MHz IF input
for sweeps starting below 10 kHz:
EZM 10 MHz sync signal ==> ESH3 10 MHz ext. sync

- the EZM and the ESVP have to be linked (see EZM manual for details):
  ESVP 10.7 MHz broad IF output ==> EZM 10.7 MHz IF input
  (EZM 10 MHz sync signal ==> ESVP 10 MHz ext. sync)

- sweeps should NOT be aborted before they have come to an end
  otherwise the GPIB communication may unrecoverably fail

Known Bugs:

1.) Currently it is not possible to run a sweep with a sweep table that uses both the ESH3 and the ESVP. Separate use of course is possible.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K15 *
****

Note:

1.) After installation, the drivers for the analyzers

- FSA, FSB, FSM (firmware version 2.75/2.75/2.75)

have been installed. For use in the ES-K1, they have to be declared in the DEVICE CONFIGURATION.

Because of the similarity within this receiver family, these receivers are adressed with the common sybolical name "FSX".

2.) The receiver specific data,

- sweep tables

are enclosed in the corresponding directories:

for the ESXI:
<installation path>\IMP\K15\FSX\

They have to be IMPORTED from the application, e.g.:
import sweep tables from path C:\ES_K1.150\IMP\K15\FSX

Known Bugs:

1.) Receiver Dialog of FSA, FSB and FSM:

Any calibration error will not be indicated. The calibration result will always give "Calibration completed".

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K2 *
****

Note:

1.) The Script window is not affected by the window settings of the main applications, e.g., 'Tile' is valid for opened graphics configurations only.

2.) After installation, a driver to use the application as a DDE client (via script) is available. It has to be declared and configured in the device configuration.

Known Problems:

1.) Breakpoints in subscripts that are located in include files cannot be set until the script execution is interrupted and the current execution line is located within that specific include file.

2.) Breakpoints have to be set on those lines that contain some kind of action/evaluation, i.e., a breakpoint on lines with a single statement like BEGIN, END, ELSE won't be recognized during script execution.

3.) When selecting global/local variables, the length of the names may exceed the width of the combo box field; in that case the complete name and value can be inspected via the 'Edit' dialogue.

4.) A "step over" (over function calls) is not possible. Therefore breakpoints have to be used instead.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K30 *
****

Note:

1.) After installation, the drivers for the peripherals

- HCM (firmware version 1.06 for HCC)
- HCT (firmware version 1.06 for HCC)

have been installed. For use in the ES-K1, they have to be declared in the DEVICE CONFIGURATION.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K31 *
****

Note:

1.) After installation, the driver for the peripheral

- HCA (firmware version 1.06 for HCC)

has been installed. For use in the ES-K1, it has to be declared in the DEVICE CONFIGURATION.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K32 *
****

Note:

1.) After installation, the drivers for the peripherals

- EMCO 1050 (controller for automatic antenna tower)
- EMCO 1060 (controller for automatic turntable)
- EMCO 1090 (used as 1050 + 1060)
- EMCO 2090 (used as 1050 + 1060)

have been installed. For use in the ES-K1, they have to be declared in the DEVICE CONFIGURATION.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K33 *
****

Note:

1.) After installation, the drivers for the peripherals

- HD MA2xx (controller HD 100 for automatic antenna tower)
- HD DT3xx (controller HD 100 for automatic turntable)

have been installed. For use in the ES-K1, they have to be declared in the DEVICE CONFIGURATION.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K34 *
****

Note:

1.) After installation, the driver for the peripheral

- HD KMS5xx (controller HD 100 for automatic slidebar)

has been installed. For use in the ES-K1, it has to be declared in the DEVICE CONFIGURATION.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K35 *
****

Note:

1.) After installation, the driver for the peripheral

- Heraeus Voetsch Air Condition Cabinet HC4055

has been installed. For use in the ES-K1, it has to be declared in the DEVICE CONFIGURATION.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K36 *
****

Note:

1.) After installation, the driver for the peripheral

- ELGAR 9012 Programmable Power Supply

has been installed. For use in the ES-K1, it has to be declared in the DEVICE CONFIGURATION.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K37 *
****

Note:

1.) After installation, the drivers for the peripherals

- AKZO ASC-300 (controller for automatic antenna tower)
- AKZO ASC-300 (controller for automatic turntable)

have been installed. For use in the ES-K1, they have to be declared in the DEVICE CONFIGURATION.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K50 *
****

Note:

1.) After installation, the generic GPIB drivers

- USER IEC

have been installed. For use in the ES-K1, they have to be declared in the DEVICE CONFIGURATION.

****
* ADDITIONAL INFORMATION FOR ES-K1 OPTION *
*
* ES-K51 *
****

Note:

1.) After installation, the driver for the peripheral

- high current artificial mains network NSLK 8128

has been installed. For use in the ES-K1, it has to be declared in the DEVICE CONFIGURATION.

ROHDE&SCHWARZ
Test and Measurement
Division

Manual

EMI Test Software for R&S EMI Receivers and Accessory

ES-K1

1026.6790.02

Version 1.50

Printed in the Federal
Republic of Germany

Certified Quality System

ISO 9001

DQS REG. NO 1954-04

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ROHDE & SCHWARZ GmbH & Co. KG
Postfachadresse: Postfach 80 14 69 · D-81614 München
Hausadresse: Mühldorfstraße 15 · D-81671 München
Telefon: (München 089) 41 29-0 · International: (4989) 41 29-0
Telefax: (München 089) 41 29-21 64

Zweigniederlassungen — Subsidiaries in Germany

Zweigniederlassung Berlin Ernst-Reuter-Platz 10 **D-10587 Berlin**	Tel. (0 30) 34 79 48-0 Telefax (0 30) 34 79 48-48
Zweigniederlassung Büro Bonn Josef-Wirmer-Straße 1–3 **D-53123 Bonn**	Tel. (02 28) 9 18 90-0 Telefax (02 28) 25 50 87
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Zweigniederlassung Neu-Isenburg Siemensstraße 20 **D-63263 Neu-Isenburg**	Tel. (0 61 02) 20 07-0 Telefax (0 61 02) 80 00 40
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USA	COM: ROHDE & SCHWARZ, INC. 4425 Nicole Drive **Lanham,** MD 20706 T & M: TEKTRONIX, INC. P.O.B. 500 **Beaverton, OR 97077**	 (301) 4598800 (301) 4592810 (800) 4262200 (413) 4488003
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For areas not listed contact:	ROHDE & SCHWARZ GmbH & Co. KG Postfach 80 14 69 D-81614 München Telefax Int. +49-89-41 29 36 62	Division 5Z

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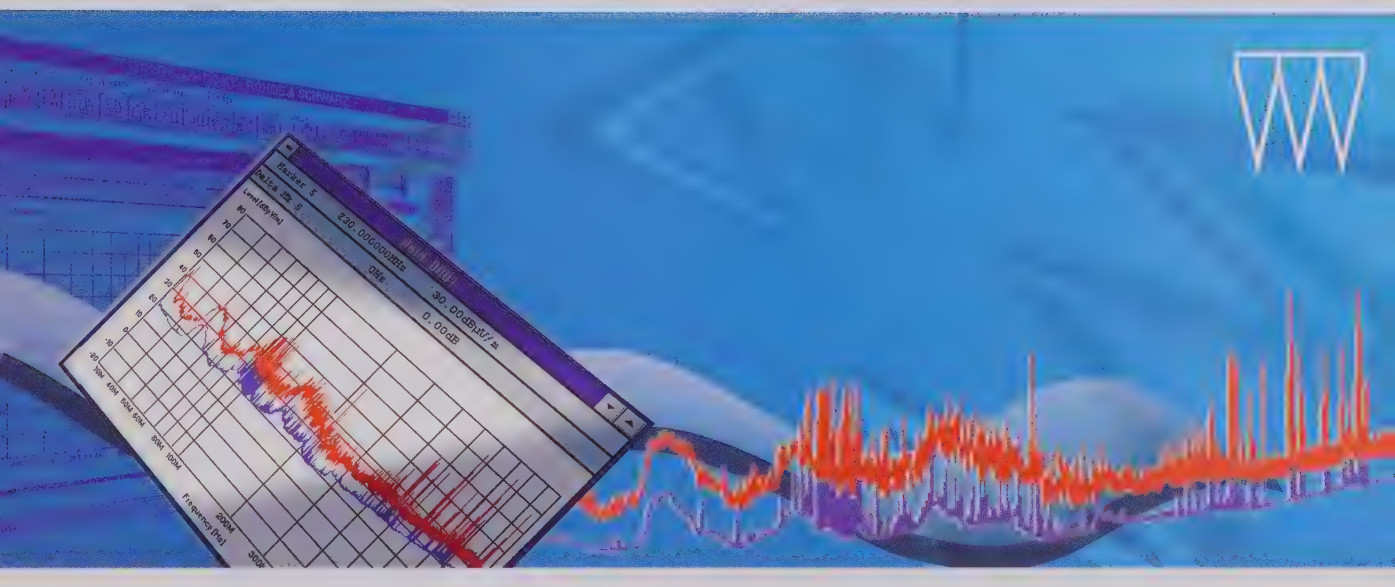


EMI Software ES-K1

for fast, accurate and reproducible measurements

- User-friendly EMI test software under Windows™
- EMI measurements to commercial and military standards such as CISPR, VDE, FCC, EACL, ANSI, EN; MIL, VG, DEF-STAN, GAM-EG13
- Flexible adaptation to other standards
- Fully automatic and interactive operation for maximum speed, reproducibility and user friendliness
- Automatic compensation of transducers (correction factors) and limit lines
- Evaluation of narrowband/broadband interference
- Test setup calibration
- Convenient and flexible result documentation
- Easy and open-end expandability for system applications thanks to modular design

ROHDE&SCHWARZ

Uses

EMI Software ES-K1 from Rohde & Schwarz is an advanced, user-friendly tool which can be used highly effectively for all conducted and radiated emission measurements.

The number of measurements required for ensuring electromagnetic compatibility is ever increasing – and with it the demand to make these measurements reliable, reproducible and economical.

EMI Software ES-K1 complies with these exacting requirements for measurements both to international commercial standards (CISPR, EN, ANSI, SAE, FCC, EACL, VDE) and military standards (MIL, VG, DEF-STAN, GAM-EG13). Adaptation to other standards is possible.

Commercial EMI measurement standards stipulate a variety of regulations and limit values for RFI voltage, RFI power and RFI field strength whereas the military standards specify measurements and limit values for conducted and radiated emissions.

The powerful EMI Software ES-K1 is suitable for both fields of application.

Fully automatic operation supported by the Rohde & Schwarz EMI test receivers and a large number of accessories such as mast, turntable, absorbing clamp/slideway and artificial mains networks make even complex EMI measurements reliable and fast over a wide frequency range. The interactive mode lets the operator utilize his experience to the full and for instance identify and catalog signals in open-area measurements.

The software under Windows™affords ease of access to the program. The user-friendly graphics interface allows the operator to concentrate on the measurement task. Thanks to a flexible report configuration, informative documentation of results in graphic and tabular form is possible along with the associated test setup.

EMI Test Receiver ESMI operated via EMI Software ES-K1

Characteristics

User interface

In addition to the menu items FILE, EDIT, WINDOW and HELP common for Windows™ applications, the EMI Software ES-K1 can be controlled via two additional menus.

In the OPTIONS/DEVICE CONFIGURATION menu, the user needs to define the device configuration, ie test receiver and accessories, just once. The language, eg German or English, can be selected.

The TEST menu is provided for interactive adjustment and control of the individual devices. The automatic test sequences which are script-defined (see below) are started in this menu. In addition, a variety of test and analysis functions is available.

In the FILE menu, import and export functions are available for a data exchange between the user and Software ES-K1. In addition, the total software configuration can be stored.

Flexibility based on scripts

In addition to the available scan, sweep and measurement functions, so-called scripts, ie test sequences in a process language, allow fully automatic or interactive control as required. A user-defined script parameter set controls the test sequence and the generation of reports.

In addition to standard scripts, user-specific scripts can be generated and existing ones modified with the aid of the EDIT option. In this way, the user's special know-how can be optimally utilized for the measurement on hand. Effective debug aids and further test facilities are also available.

Efficiency through data reduction

EMI Software ES-K1 offers a wide selection of data reduction methods as a link between the scan or sweep function for the preview of the spectrum and checking at discrete frequencies:

The most important evaluation methods are acceptance analysis, subrange maximum and minimum determination, peak and maximum analysis, narrowband/broadband discrimination using tuning and peak/average comparison methods. Furthermore it is possible to combine test results, read out broadband interference to MIL in a display (/MHz) or suppress known environmental interference by way of a frequency list in open-area measurements.

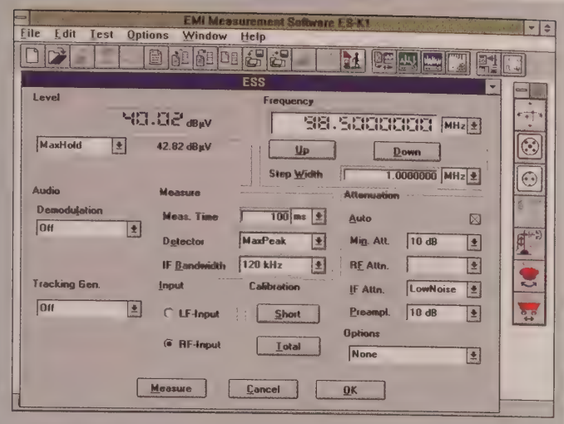
Integrated data base

EMI measurements require generation and processing of a large number of different data – transducer factors, limit lines, scan and sweep data as well as results in graphic and tabular form and test reports for documentation.

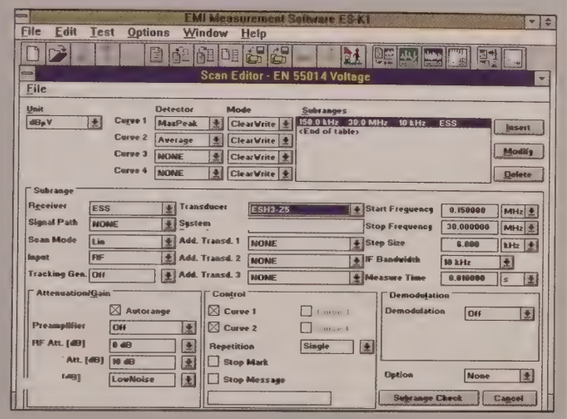
A data base is integrated in EMI Software ES-K1 for data management. This enables convenient data access by way of informative short descriptions doing away with tiresome file searching.

Special input masks, eg for generating transducer factors and limit lines, may be used for extending the data records supplied. Major standards are covered

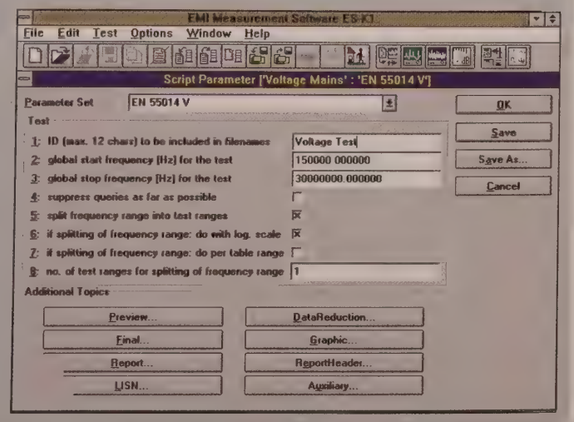
EMI Test Receiver ESMI operated via EMI Software ES-K1: direct control of individual units



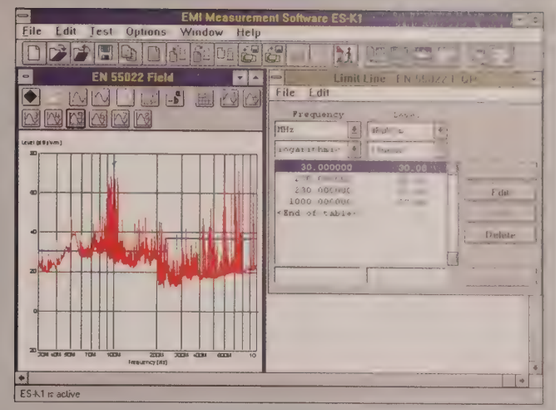
Additional optimization of measurement parameters for frequency subranges in standard preset scan tables



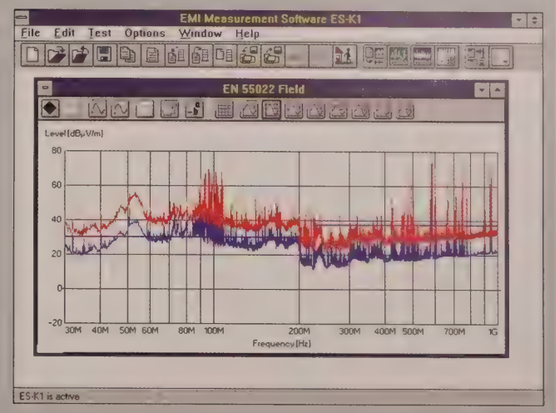
Standard parameter configuration for standard measurements with flexible scripts



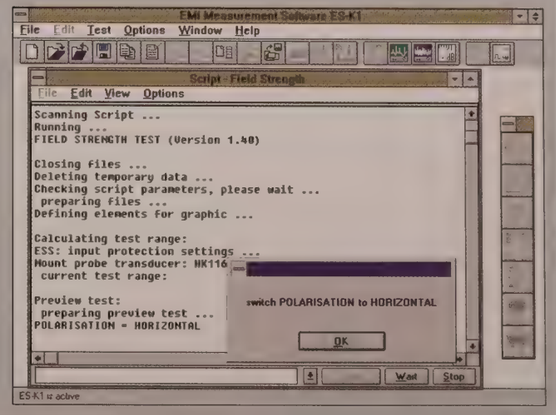
Integrated data base for simple editing of limit lines, transducer factors as well as scan or sweep tables



Clear display of frequency spectra of two detectors operating in parallel



Fully automatic control of even complex EMI measurements using scripts for saving time and costs



by prepared scripts to allow fast and uncomplicated use of the EMI software.

Result display

Versatile and flexible result display is possible in tabular or graphic form. A maximum of eight test results, limit lines and transducer factors can be displayed simultaneously – even in different windows – with linear or logarithmic scaling of the frequency axis. The shape, line type and colour of the curve can be adapted optimally to the requirements.

There are two mouse-controlled cursors for interactive graphic evaluation. The zoom function allows enlargement of the result display to any size.

Report configuration

The integrated report configuration function allows the user to determine largely the form of his test report. In addition to the report header, all data relevant to the measurement can be output, eg scan and sweep tables. Output of test results, limit lines and transducer factors is possible in tabular and graphic form.

Another way of generating the report is by automatic data exchange of Windows™ programs: the documentation is generated with the user's own word processing program, eg WORD for Windows™. Graphs and texts from ES-K1 can be exported via the buffer store of Windows™ and copied into the user-generated test report where desired. This process can be fully automated via the DDE (dynamic data exchange) function integrated in the ES-K1. For the hardcopy of test reports all Windows™-supported printers and plotters are suitable.

Receivers and accessories

EMI Software ES-K1 supports all EMI test receivers and spectrum analyzers from Rohde&Schwarz: the state-of-the-art Test Receiver Family ESHS, ESVS, ESPC, ESCS and ESS, the EMI Test Receivers on spectrum analyzer basis ESAI, ESBI and ESMI (up to 26.5 GHz), as well as the well-proven ESH3, ESVP and EZM family.

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P.O.B. 801469 · D-81614 München · Telephone +4989 4129-0 · Fax +4989 4129-3777 · Internet: http://www.rsd.de

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1 Introduction

1.1 Overview

1.1.1 Introduction to the Manual

The following chapters provide a complete description of the EMI Application Software ES-K1. Users working with the EMI Apllication Software ES-K1 for the first time are recommended to read through chapters 1 to 4 one after the other.

Chapter 1 "Introduction", provides a general overview.

Chapter 2 "Graphical User Interface", describes the elements of the graphical user interface.

Chapter 3 "Standard Script Description", provides information on the enclosed standard scripts.

Chapter 4 "Standard Device Drivers", describes the function of the Rohde & Schwarz V-networks, relay switching units, etc..

The Options ES-Kxx provide information about the use of the script language FSL (Flexible Script Language) and the device drivers.

Option ES-K2, "Script Development Kit", explains how a script is produced and includes a description of the general language elements of FSL and a list of all standard functions, system-specific and device-specific functions.

Option ES-K1x, "Device Driver", contains a list of all device drivers for test receivers and spectrum analyzers including their application, which are supported by the EMI Application Software ES-K1.

Option ES-K3x, "Device Driver", contains a list of all device drivers for accessories including their application, which are supported by the EMI Application Software ES-K1.

Option ES-K50, "Device Driver", contains the universal IEEE-bus device driver for simple ASCII communication with devices that can be controlled via IEEE bus.

Option ES-K80, "Device driver", contains the device driver for the R&S TTL card PS-B11.

1.1.2 Short Description

The Rohde&Schwarz EMI Software package ES-K1 is an up-to-date and user-friendly software which can be ideally used for all EMI measurements of conducted and radiated interference.

The number of measurements required to ensure electromagnetic compatibility (EMV) is continuously increasing, along with the demand for reliability, reproducibility and economic efficiency of these measurements.

Features of the EMI Application Software ES-K1:

- User-friendly software under unter WINDOWS™ 3.1 / 3.11 or WINDOWS™ 95 (16-bit application)
- EMI measurements both to international **commercial standards** (CISPR, VDE, FCC, VCCI, ANSI, EN) and **military standards** (MIL, VG, DEF-STAN, GAM-EG13)
- Possible adaptation to other standards
- Automatic and interactive mode
- Transmission factors and limit lines are automatically considered in the calculation of the results
- Evaluation of narrowband and broadband interference
- Calibration of the test setup
- Comfortable and flexible documentation of measurement results
- Various ways of data export
- Future extensions can be easily implemented due to the option concept

1.1.2.1 Graphical User Interface

The EMI Application Software ES-K1 for WINDOWS™ is equipped with a **graphical user interface**, which permits to start with the program immediately and can be readily operated by the user.

1.1.2.2 Operating Modes of the Software

The measurement procedures can be executed either in interactive mode or automatically, depending on the application of the software.

a) Interactive mode
In interactive mode, each device can be controlled individually by means of its own window. All other functions such as measuring and analyzing functions can also be operated interactively.

b) Automatic mode
The automatic measurement runs are implemented by scripts of a macro language, thus releasing the user from routine tasks. The scripts control the measurement run, evaluate the measurement results and produce the necessary reports for documentation of the measurement results.

An option for the system software is the **Script Development Environment** (ES-K2). This environment permits the user to modify the supplied standard scripts in order to match them to the latest standards. It also allows him to develop scripts that cover completely new standards. Of course, this environment also contains debugging aids and test facilities, which simplify the generation and modification of the scripts.

1.1.2.3 Measuring and Analyzing Functions

The Software ES-K1 supports a number of measuring and analyzing functions. This is necessary to minimize the number of measurements to be performed again, which are very time-consuming.

Possible measurements are the scan, the execution of a fast overview measurement (sweep with ESxl) and the measurement performed at discrete frequencies.

The most important **ways of evaluation** (data reduction) are the acceptance analysis, peak reduction, subrange maxima and subrange minima reduction, maxima reduction and narrowband/broadband discrimination.

Further possible evaluations are used to combine measurement results, output MIL measurement results in a broadband-related display (/MHz) and eliminate known interference, e.g. ambients.

A very particular type of data handling is the GTEM correlation, which permits to convert measurement results to open-area conditions using the GTEM cell.

1.1.2.4 Graphics and Report

Measurement results, limit lines and transducer factors can be displayed in a manifold and flexible way as **table** or **graphics**. Up to eight different traces can be shown in a window with linear or logarithmic frequency axis. The shape, line style and colour of the graphical elements can be optimally adapted to the requirements of the documentation.

For interactive, graphical evaluation of the measurement results, a marker and a delta marker are available, which can be easily positioned using the mouse. The zoom function permits to enlarge any section of the measurement. The measurement results can be displayed simultaneously in various windows.

The measurement results are summed up in a report which is configured by the user himself. In addition to a report header, all data relevant to the measurement can be output, e.g. scan and sweep table. The output of the measurement results, limit lines and transducers is possible both in tabular and graphical form.

1.1.3 Licence

The EMI Application Software ES-K1 is protected by a hardware adapter (hardlock), which is connected to the parallel interface of the computer. This does not impair the function of the interface, i.e. the adapter is transparent for the user.

Note:

The user must make sure that the hardlock is firmly connected!

1.2 Installation

1.2.1 System Requirements

EMI Application Software ES-K1 can be used with any computer fulfilling the following system requirements:

- Microsoft WINDOWS™ 3.1 / 3.11 or WINDOWS™ 95 compatible
- CPU: 486; PENTIUM recommended
- 8 Mbyte RAM; 16 Mbytes recommended
- At least 10 Mbytes free memory on the harddisk
- VGA graphics adapter; SVGA recommended
- IEC/IEEE-bus interface compatible with National Instruments GPIB interface with WINDOWS device driver (AT-GPIB/TNT, PCII/IIA, PCI-GPIB, PCMCIA-GPIB)

EMI Software ES-K1 fitted with the associated drivers for IEC/IEEE-bus interface can be used with operating systems

- WINDOWS 3.1
- WINDOWS 3.11 (WINDOWS for WORKGROUPS)
- WINDOWS 95

The installation software automatically considers the conditions depending on the operating system.

Note: *All path indications generated in the ES-K1 have to comply with DOS conventions, ie meet the rule <8 characters>.<3 extension>.*

1.2.2 Option Concept

Due to its **option concept** the software is easy to handle and future-safe. The drivers required for the units and additional software options are combined to form the software core.

EMI Software ES-K1 supports all EMI test receivers and spectrum analyzers from Rohde & Schwarz, ie the models of receiver family ESCS, ESHS, ESVS, ESVD, ESPC und ESS, the EMI test receivers based on spectrum analyzers ESAI, ESBI und ESMI as well as the well-proven family ESH3, ESVP and EZM.
In addition to these receivers, a large number of remote-controllable accessories is used. These are amongst others artificial-mains networks and V-networks ESH2-Z5, ENV4200 and ESH3-Z5, Absorbing Clamp Slideway HCA for the measurement of conducting interference as well as remote-controllable Mast and Antenna Positioning Mast HCM and Turntable HCT for measuring RFI fieldstrength in conjunction with Positioning Controller HCC. Relay matrices PSU, RSU and PSN are used for switching the antenna and transducers.

1.2.2.1 Basic Program

EMI Software **ES-K1** comprise the following components:

- EMI software core under WINDOWS™ contains the graphics user interface, standard scripts for automated test sequences and other standard data (limit values, etc.)
- Drivers for R&S artificial-mains networks ESH2-Z5, ENV4200 and ESH3-Z5 as well as for R&S relay switch (PSU, RSU or PSN).
- Internal database for data management (scripts, limit-value lines, transducers, graphics, scan tables, test results, etc.)

The data of ES-K1 internal database can be exported for transfer and filing operations, new data can be imported.
The internal database can be configured with the supplied standard data during the installation.

1.2.2.2 Options

The following options (receiver and accessories) can be used with ES-K1:

ES-K2 Script development environment

ES-K10 Driver and data for R&S EMI test receivers ESCS / ESPC / ESHS / ESVS / ESVD
ES-K11 Driver and data for R&S EMI test receivers ESS
ES-K12 Driver and data for R&S EMI test receivers ESAI / ESBI / ESMI
ES-K13 Driver and data for R&S EMI test receivers ESH3 / ESVP
ES-K14 Driver and data for R&S EMI test receivers ESH3-EZM / ESVP-EZM
ES-K15 Driver for R&S spectrum analyzers FSA / FSB / FSM
ES-K30 Driver for R&S Mast HCM and Turntable HCT
ES-K31 Driver for R&S Absorbing Clamp Slideway HCA
ES-K32 Driver for EMCO Mast with Controller 1050 and EMCO Turntable with Controller 1060, as well as for combined Controllers 1090 and 2090
ES-K50 Universal IEC/IEEE-bus driver
ES-K80 Driver for Rohde&Schwarz TTL Interface PS-B11

1.2.2.3 Multiple-user Licences

ES-K100 Licence for the use of EMI Application Software by several users. The required additional hardlocks are supplied for each ES-K100 ordered.

1.2.3 Installation Instructions

Scope of supply of EMI Software ES-K1:

- Set of 5 disks or CD-ROM for installing the software
- Hardlock key (dongle) for authentication
- Option disk with customer-specific authentication code
- Operating manual

EMI Software ES-K1 is installed on the PC from the supplied set of disks or the CD-ROM.

1.2.3.1 Authentication

When using ES-K1 software, the hardlock key (dongle) is required for authentication if a test receiver and/or accessories are to be controlled via the IEC/IEEE-bus interface. If the software is operated without a suitable hardlock, it runs in the im **Demo mode**, ie the IEC/IEEE bus cannot be physically addressed, the units can only be operated virtually. The other functions can all be used without any restriction.

The hardlock is not required during installation but on starting the ES-K1.

1.2.3.2 Option Disk

This disk which is supplied in addition to the installation disk and queried by the software during installation contains the ID files (ID: identification) coded to the associated hardlock key according to the specific customer's requirements. The files allow the use of ES-K1 with the user's test receivers or options (accessories). The options are offered by the setup program for installation.

1.2.3.3 Preparation for Installation

Prior to installation, check the IEC/IEEE-bus configuration for correct settings (using the configuration program supplied with the IEC/IEEE-bus card):

DMA Channel:	**NONE**, driver setting and interface setting should match
Base I/O Address:	driver setting and interface setting should match
Interrupt Line:	driver setting and interface setting should match
Enable Auto Serial Polling:	**NO**

All settings can be performed indepedent of the operating system using the associated configuration programs. This can be done in the SYSTEM CONTROL under WINDOWS 3.x. Under WINDOWS 95 the configuration is to be set in the SYSTEM CONTROL under SYSTEM using the DEVICE MANAGER. If the software is operated on a computer without IEC/IEEE-bus driver, the ES-K1 displays the error message ("Data error - Data GPIB.DLL not found."). This message can be ignored, the software runs in the demo mode in this case.

1.2.3.4 Starting the Installation

EMI Application Software ES-K1 is installed under WINDOWS. To do this, the first installation disk is to be inserted in the corresponding drive.

The installation under WINDOWS 3.x is performed with the program manager or the file manager:

1. Open the **File** menu. When menu item **Execute...** is selected, a window is opened to start the setup program. All executable files are displayed in the selection window by clicking the **Search...** key and selecting the source drive (A: or the suitable drive letter).

2. Select the **setup.exe** file and confirm the settings with the **OK** key.

The installation is performed via the taskbar under WINDOWS 95:

1. Open the **Start** menu. Select the menu item **settings** and **system control** to open the associated window.

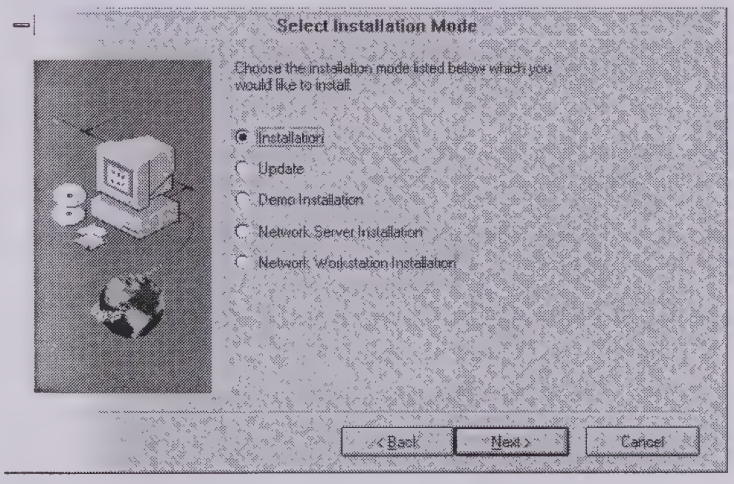
2. The dialog is opened by clicking the icon **Software** and the **setup.exe** program is automatically selected from the disk by clicking the Installation key.

Note: *The installation language is in English. Prior to starting the setup program terminate all other WINDOWS applications.*

When re-installing EMI Software ES-K1 all presettings offered in the queries and dialogs of the installation program can be accepted with **Next** or **Continue**.

1.2.3.5 Installation Options

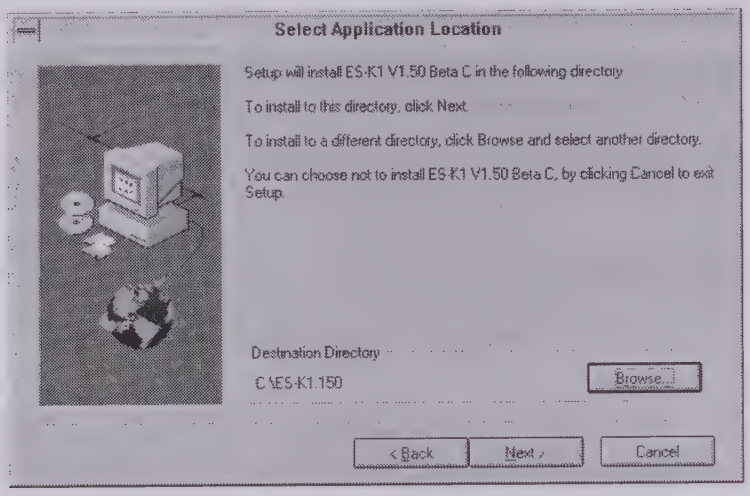
After starting the setup program the following is displayed on the screen:



The options **Installation**, **Network Server Installation** and **Network Workstation Installation** are provided for the (new) installation of the EMI software in a „stand-alone" system or in a network.
The option **Update** is used for former versions of the EMI software, which is installed in the system.
The option **Demo Installation** performs an installation of the ES-K1 specifically for demos.

1.2.3.5.1 Option Installation

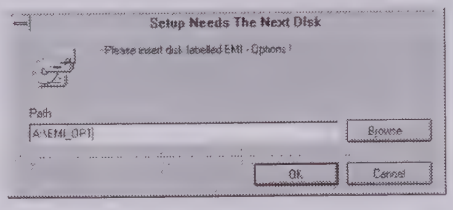
This option allows the installation of EMI Software ES-K1, the supplied drivers and options (by querying the option disk) and the pre-configured database.


Select Application Location
Setup will install ES-K1 V1.50 Beta C in the following directory
To install to this directory, click Next.
To install to a different directory, click Browse and select another directory.
You can choose not to install ES-K1 V1.50 Beta C, by clicking Cancel to exit Setup.
Destination Directory
C:\ES-K1.150
Browse...
< Back
Next >
Cancel

This dialog field selects the directory, in which EMI Software ES-K1 is to be installed. Use the **Browse..** key to change the directory or to enter a new directory.

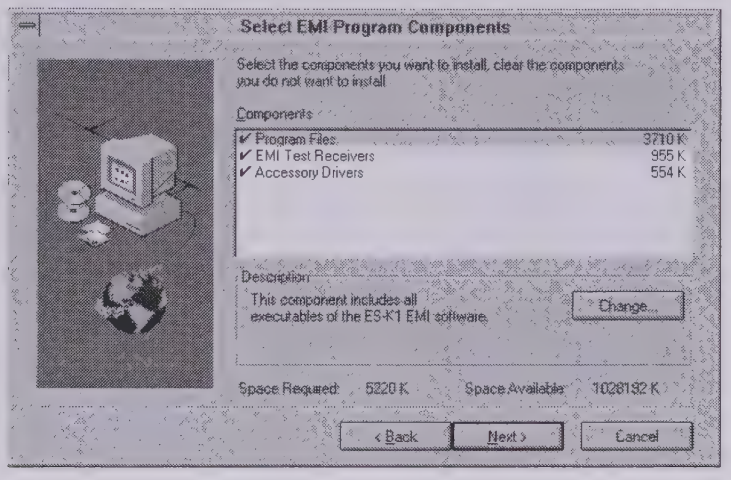
Note: *The path name under which the ES-K1 software is to be installed should not exceed a length of 30 characters.*

The setup program then queries the customer-specific option disk:

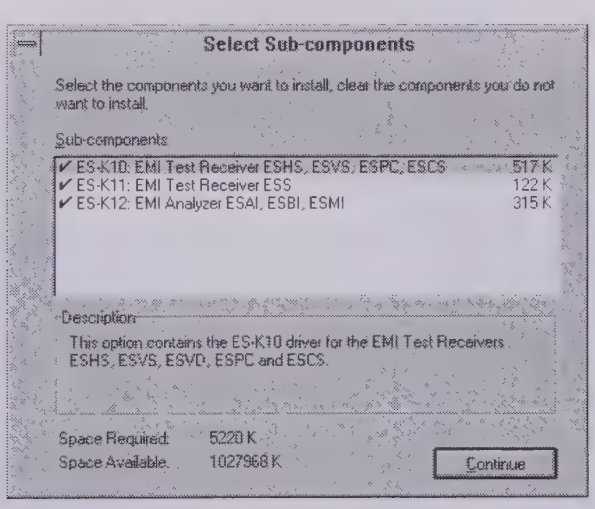


After inserting the option disk in the cooresponding drive, the setup program offers the drivers and options for EMI Software ES-K1 via the supplied ID files. All supplied components are usually installed, confirmation with the **Next** key is sufficient.

If only specific options are to be installed, selection is via **Change..** key from selected components **Program Files**, **EMI Test Receivers** and **Acessory Drivers**:


Select EMI Program Components
Select the components you want to install, clear the components you do not want to install
Components
✔ Program Files 3710 K
✔ EMI Test Receivers 955 K
✔ Accessory Drivers 554 K
Description
This component includes all executables of the ES-K1 EMI software.
Change...
Space Required: 5220 K
Space Available: 1028192 K
< Back
Next >
Cancel

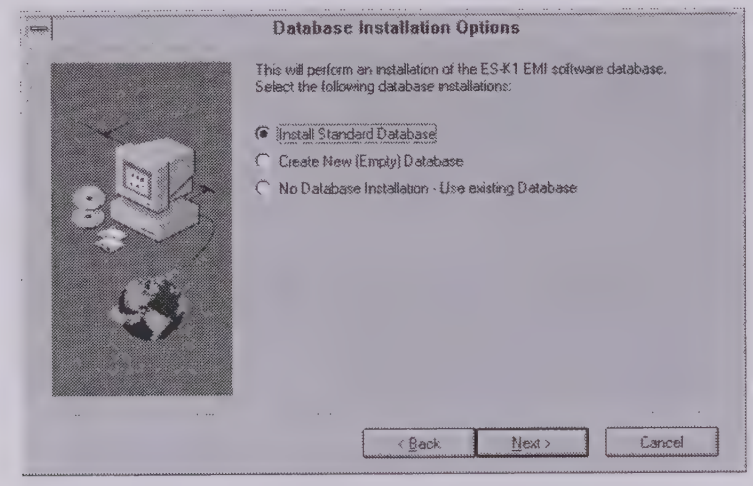
After selecting the corresponding components and clicking the **Change...** key, another dialog field allows the specific selection of options by a click:


Select Sub-components
Select the components you want to install, clear the components you do not want to install.
Sub-components
✔ ES-K10: EMI Test Receiver ESHS, ESVS, ESPC, ESCS 517 K
✔ ES-K11: EMI Test Receiver ESS 122 K
✔ ES-K12: EMI Analyzer ESAI, ESBI, ESMI 315 K
Description
This option contains the ES-K10 driver for the EMI Test Receivers ESHS, ESVS, ESVD, ESPC and ESCS.
Space Required: 5220 K
Space Available: 1027968 K
Continue

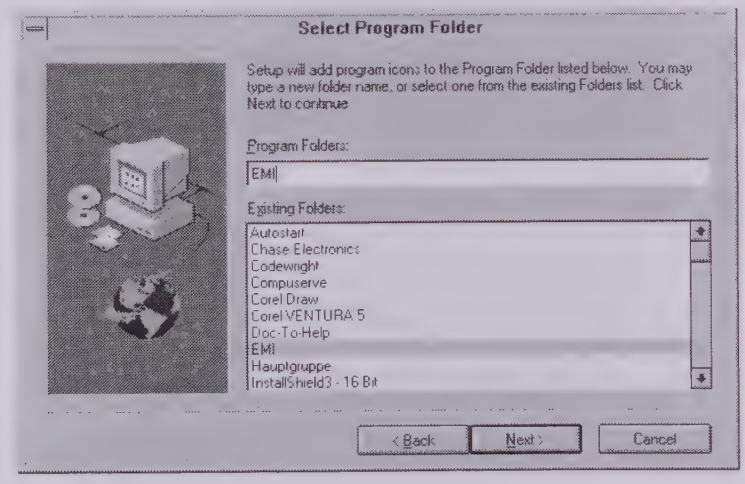
After selecting the components and options to be installed, the installation of the pre-configured database for EMI Software ES-K1 is offered.

The option **Install Standard Database** installs the pre-configured database with the standard data (scripts, limit-value lines, scan data, transducers, etc.). The option **Create New Database** is used when an existing external database is to be imported after the installation.

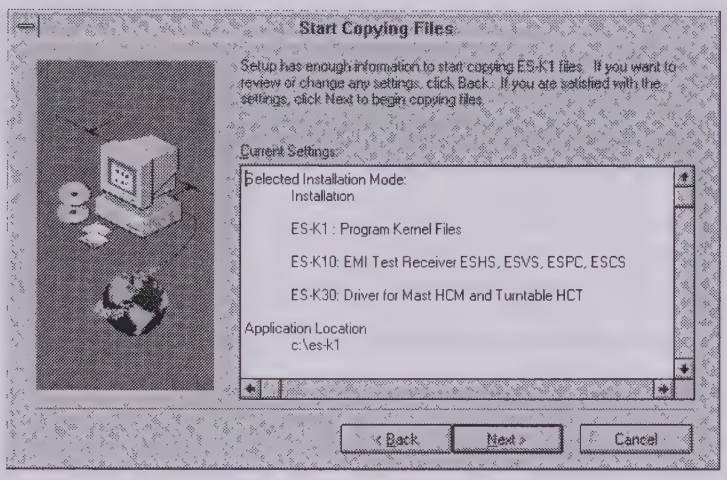
If an ES-K1 database is detected, either the existing database is saved in a backup directory before creating the new database or this step is skipped by selecting the option **No Database Installation**.


Database Installation Options
This will perform an installation of the ES-K1 EMI software database.
Select the following database installations:
Install Standard Database
Create New (Empty) Database
No Database Installation - Use existing Database
< Back
Next >
Cancel

EMI Software ES-K1, the associated Readme files of the installed components and options as well as the Help files are combined in a **program group**, which can be selected via the next dialog:
Program group **EMI** is offered as a default setting:

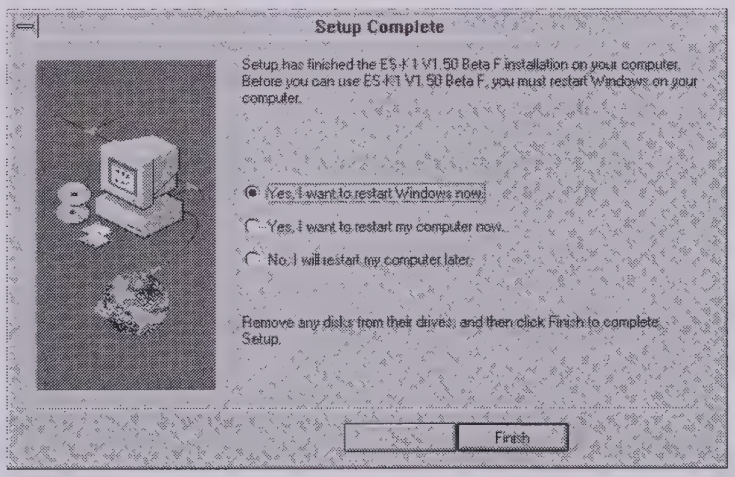


Before the installation is performed by transferring the files from the installation disks, the setup program again indicates the selected installation options, the selected components and options, the program path and the program group for verification:

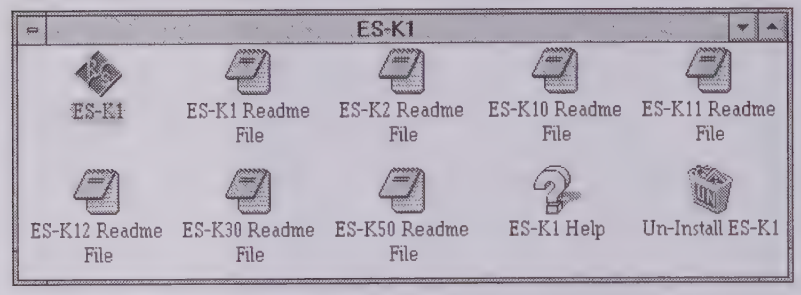

Start Copying Files
Setup has enough information to start copying ES-K1 files. If you want to review or change any settings, click Back. If you are satisfied with the settings, click Next to begin copying files.
Current Settings:
Selected Installation Mode:
Installation
ES-K1 : Program Kernel Files
ES-K10: EMI Test Receiver ESHS, ESVS, ESPC, ESCS
ES-K30: Driver for Mast HCM and Turntable HCT
Application Location
c:\es-k1
< Back
Next >
Cancel

The current state of the file transfer to the harddisk is displayed during the subsequent installation:

At the end of the installation, a re-start of WINDOWS or of the computer (depending on the operating system WINDOWS 3.x or WINDOWS 95) is offered to activate the newly installed driver of the hardlock required to operate the ES-K1:

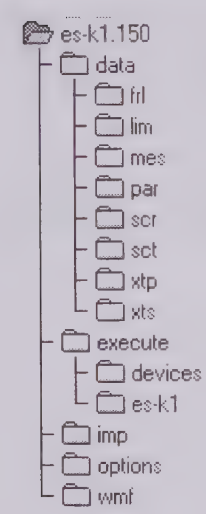

Setup Complete
Setup has finished the ES-K1 V1.50 Beta F installation on your computer. Before you can use ES-K1 V1.50 Beta F, you must restart Windows on your computer.
Yes, I want to restart Windows now.
Yes, I want to restart my computer now.
No, I will restart my computer later.
Remove any disks from their drives, and then click Finish to complete Setup.
Finish

The ES-K1 program can be started in the selected program group by clicking the R&S icon after termination of the setup program:



The **ES-K1 Readme File** contains general and additional current information on EMI Software ES-K1, which must be taken into account before using the ES-K1 software.

Directory structure of EMI Software ES-K1:



The database of EMI Software ES-K1 is installed in the DATA directory or in the directories below. All relevant data such as limit lines, transducers, scan and sweep data, test results, scripts, etc. are stored here.

The executable program components (binaries, DLLs etc.) are in the directory EXECUTE, DEVICES and ES-K1.

The supplied database which is pre-installed by the setup program is available under the directory IMP (Import). In particular, the receiver-specific scan and sweep tables can be imported from the subdirectories (K10 to K14).

The OPTIONS directory contains the customer-specific authentication files for the hardlock.

The background pictures for the ES-K1 software are stored in the WMF directory.

1.2.3.5.2 Options Network Server Installation and Network Workstation Installation

These options are used for the installation of the software in a network. EMI-Software ES-K1 is installed on the network server whereas on the workstation the ID files to be used for the options necessary to operate the EMI Test Receivers and the accessories via the IEC/IEEE bus as well as the internal database for the management of the EMI-specific data sets.
During installation on the network workstation, the path is queried for the network server.

Note: The installation on the network server requires the necessary access rights.

1.2.3.5.3 Option Update

The installation of the option **Update** serves for the automatic transfer of customer-specific hardlock key files of an existing former EMI software installation. This option does not require a specific option disk since a check for the presence of an ES-K1 software is performed at the beginning of the installation.
If such a version is detected, the drivers and options offered for the installation result from the existing ID files.

Note: *The installation of the new version of EMI Software ES-K1 should always be carried out in its own directory (without ovewriting an existing version).*

Existing data sets can be exported from the old version and imported into the new version of ES-K1.

1.2.3.5.4 Option „Demo Installation“

No customer-specific option disk is required for the installation of the demo mode, all drivers and options can be selected. This installation of EMI Software ES-K1 is provided for trying out the software in the demo mode (without active operation via the IEC/IEEE bus) or for full operation of ES-K1 with hardlock code 001.

1.2.3.5.5 De-installation of ES-K1 Software

To de-install EMI Software ES-K1, double-click the **Un-Install ES-K1** icon. The de-installation software clears all subdirectories generated under the installation directory and files, except the database files created by the user after the installation as well as the file ES-K1.INI in directory ..\EXECUTE.
The above-mentioned files or the paths created after the installation are to be manually cleared, as required.

1.2.3.6 First Steps after Installation

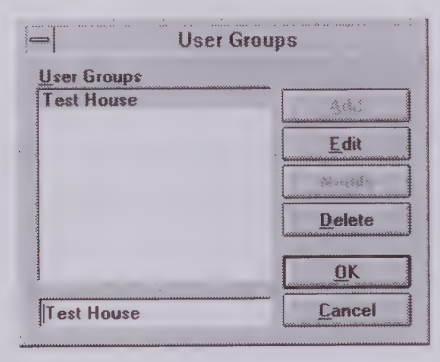
EMI Software ES-K1 has a **password protection** for each user, which offers the following advantages:

- The data are protected against unauthorized access
- The configuration of the system can be only changed by authorized persons

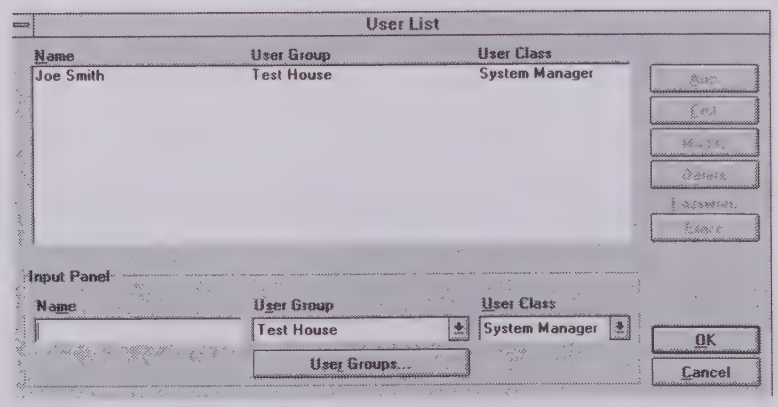
In addition, each user of ES-K1 is allocated to a **user group**. The user groups can be allocated to the three **user classes** with different **access rights**:

- System manager
- Extended
- Standard

User groups or user names are not provided on delivery of the software. Therefore, **log-in** dialog is not called when the ES-K1 software is started for the first time, but the **user group** dialog:

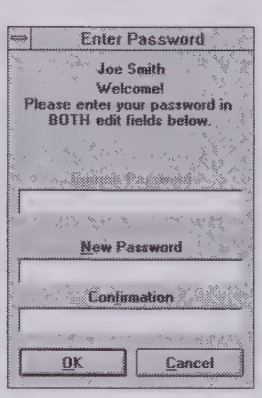


After setting up the user group with the ADD key, the list of users to belong to the defiend group is entered in the subsequent dialog:



Note: *At least one **system manager** should be defined since it is only the system manager who can enter further users in the list of users.*

When a user logs in for the first time, the entry and confirmation of the password is required:



After these steps, the installation and the setup of EMI Software ES-K1 is terminated for the user. The next chapter gives an introduction on how to perform measurements.

1.3 Introduction to Operation

In the example below, interactive control of the software is explained step by step to familiarize the user with the logical sequence of operations.

The example is based on a specific measurement task that can be performed immediately with the equipment shown. For practising, the measurement can also be performed without the said equipment in the virtual operating mode. This mode is automatically selected if there is no hardlock at the printer output of the computer. In this case, the "Test Setup" and "Block Diagram" sections are irrelevant, and the values entered into the test report are simulated values supplied by an internal random generator.

1.3.1 Measurement Task (Example)

Measurement of EMI voltage on the power line of a **domestic appliance** with 200 W power consumption; continuous interference, pure broadband interference, ie without internal processor or the like.

Test setup to **CISPR 16-2, Figure 2.**

Limit values to **EN 55014**

1.3.1.1 Test Setup

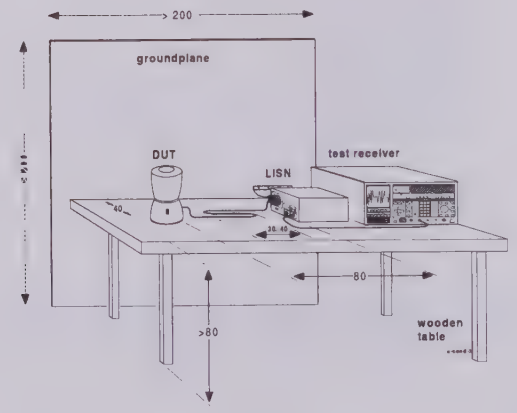


FIG 1: Test setup to CISPR 16-2

1.3.1.2 Block Diagram

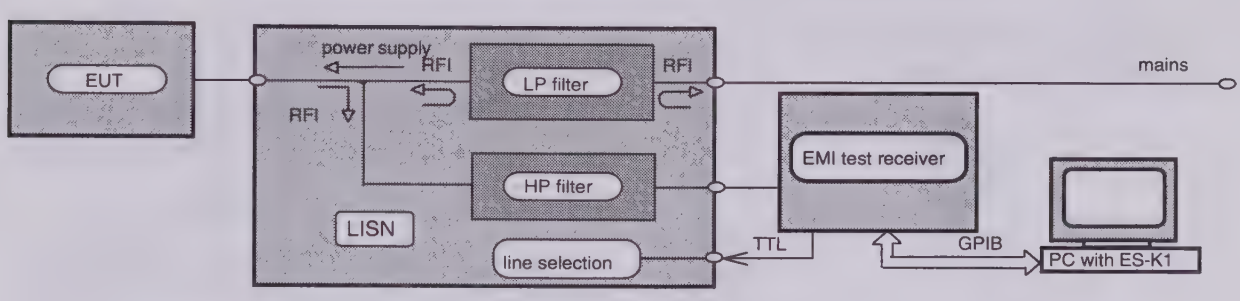


FIG 2: Block diagram of EMI test setup

1.3.1.3 Definition of Terms

Some terms necessary for understanding ES-K1 operation are explained below.

Transducers are four-terminal networks connected between the input of the test setup and the test receiver, for example a test antenna in EMI field strength measurements. The antenna converts in a defined manner the EMI field strength level (given in dB(µV/m) for electrical field strength) into a voltage level (measured in dB(µV)), which is displayed by the test receiver. The difference between the two numerical values is referred to as transducer factor (unit: dB(1/m)), which is usually frequency-dependent. Stored transducer data, therefore, always include the transducer factor and the conversion into the correct unit so that the result displayed has the correct magnitude and unit.

Standards, which are listed in the ES-K1 database, contain information on emission limit values, the frequency range to which a given standard applies and on the setup of the test receiver. All of the standards in question cover product families. For example, the EN55014 standard applies to "Electrical equipment and systems" covering, among other equipment, all domestic appliances and electric tools.

Scanning is the tuning of the test receiver step by step across a given frequency range. For this, the step size (absolute or as percentage of the tuning frequency), the dwell time for each frequency, and the start and stop frequencies are to be defined. Synthesized test receivers (eg ESxS, ESS, ESPC) are typically tuned by scanning.

Sweeping is the continuous tuning of a test receiver across a given frequency range. In addition to start and stop frequencies, the time for the receiver to sweep the frequency range is to be defined. This tuning mode is typically employed by spectrum analyzers, although some analyzers can be tuned step by step as well (eg ESMI). Series ESxS and ESS test receivers have no sweep capability. No sweep tables are therefore supplied for these units.

1.3.2 Starting ES-K1 Software under Windows 3.1

Activate ES-K1 icon in Windows Program Manager field.

FIG 3: ES-K1 software icon

When program has been loaded, enter user name and password (log-in):

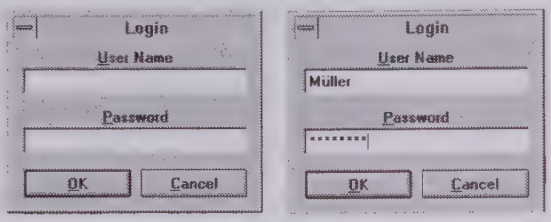


FIG 4: Log-in dialog window

NOTE: *The user name and password must be entered in exactly the same notation (upper-case and lower-case letters) as in program installation. Even the slightest difference will result in abortion of the program. It is therefore advisable to note down the user name and password before entering them during program installation.*

Confirm user name with TAB key (not with RETURN!), and password with OK or RETURN.

The response message depends on whether or not a hardlock is installed at the printer output. For practising, the program can be run without hardlock. In this case, the window (FIG 5) shown opposite will appear:

FIG 5

On confirmation with **OK,** the default background mask of ES-K1 Software (FIG 6) appears, from which operation of the program can be started.

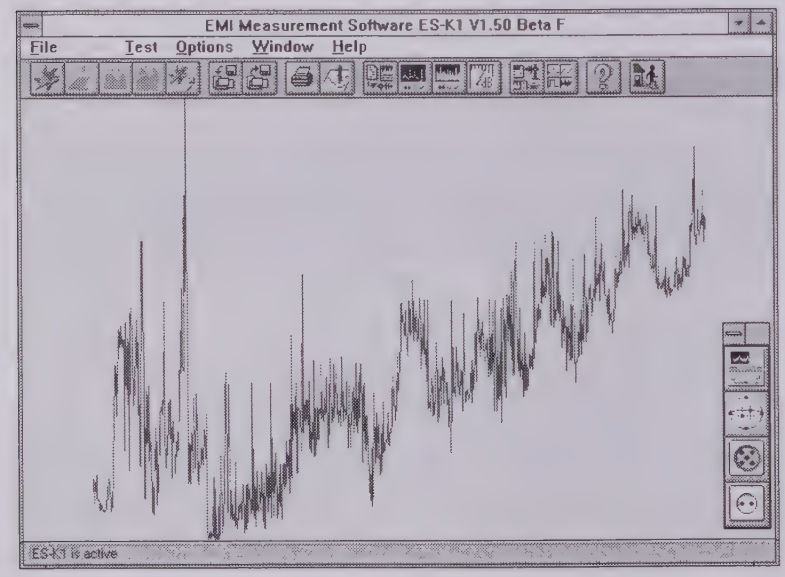


FIG 6: Background mask for Software ES-K1

1.3.3 Programming a Measurement with ES-K1 Software

As an initial step, configuration of the test equipment as shown in the test setup (FIG 2) is to be defined. For this, select **Device Configuration...** from the **Options menu**.

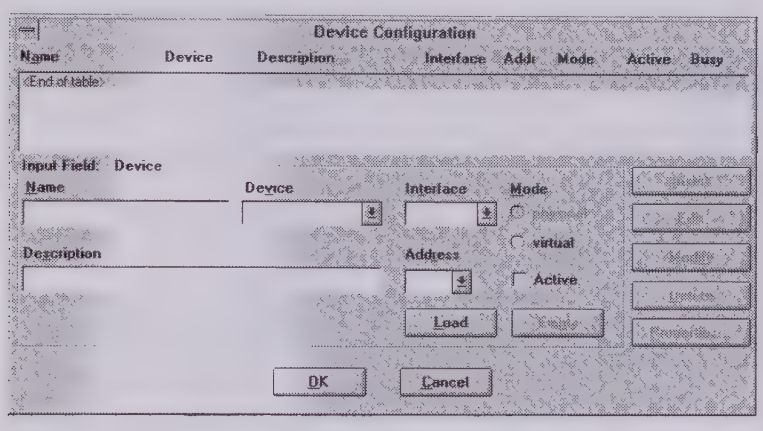


FIG 7 Device configuration dialog window

Instruments addressed by ES-K1 can be loaded into the **Device** field.

On clicking on Load, available devices appear after approx. 10 s in the **Device** field from where they can be selected by means of the scrollbar. In this example, Test Receiver ESHS is selected. Then the **Interface** (‣ GBIB0), **Address** (→17) and **Mode** are to be set. The **virtual** or **physical** mode is selected automatically depending on whether a hardlock is installed or the measurement is performed with real devices, see 1.3). Devices can be switched passive (**Active** not selected). This prevents measurement errors in the case of devices listed but not connected.

Entries in the **Name** field are optional. They describe a device more precisely if several devices of the same type are used. Entries in the **Description** field are optional, too.

On clicking on Insert, ESHS is transferred as the first device to position **<End of table>,** which thus moves one line down, ie **<End of table>** is always indicated at the end of the list.

Next, Two-Line V-Network ESH3-Z5 is to be selected in the **Device** field. ESH3-Z5 has no GPIB interface but is driven via the parallel TTL interface of the test receiver (see FIG 2), so the GPIB address of the test receiver is to be entered, ie the default address 20 is to be changed to 17. Then Two-Line V-Network ESH3-Z5 is to be transferred to the device table by clicking on **Insert.** FIG 8 shows the complete device configuration. Any entries made in the **Name** and **Description** fields are displayed in the corresponding columns of the device table.

Make sure to confirm the settings made in the **Device Configuration** window with OK, otherwise the settings will be lost. Note: if there is no response on clicking on **OK,** click on **Modify** even if no modifications were made, then **OK** will be active in any case.

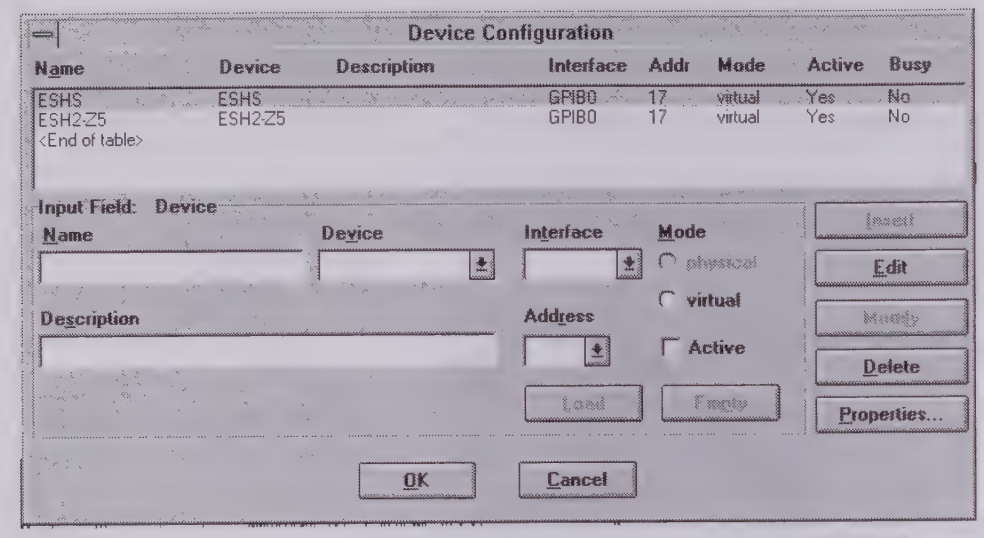


FIG 8: Completed device configuration. Return to main menu with OK.

1.3.4 Preparatory Operations for Measurement

The shortest way of parameterizing the devices used is by calling the data stored in the database of the software, ie tuning mode of test receiver (scan or sweep), transducer characteristics (eg of artificial mains networks) and limit values stipulated by standards. The ES-K1 database is managed by the **Navigator,** which is called from the **File** menu (FIG 10).

For initial use of the ES-K1 software, information first has to be loaded into the database and is then available for any subsequent measurements.

Software handling is therefore different after initial installation and subsequent operations.

After installation, the **Scan Table** for the receiver used must be loaded. To load the table, first call the **Navigator (Backup Database)** from the **File** menu.

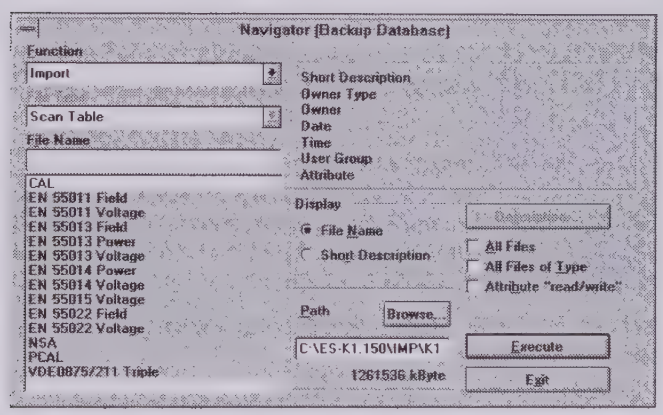


FIG 9

The **Browse** key (FIG 9) activates the **Path** dialog window with the import directory from which a subdirectory with the scan tables for the receiver used is selected.

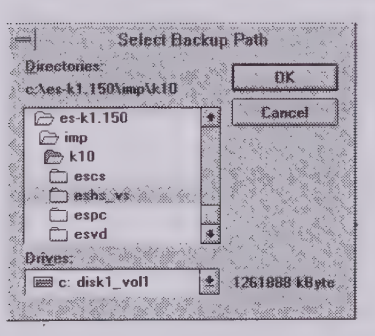


FIG 10: Subdirectory K10/EHS with scan tables for Receiver EHS

Then the required scan tables designated with the name of the standard are marked and transferred to the scan table under **Navigator...** by means of **Execute.**

The standard import database is stored in the same directory in which the ES-K1 Software was installed. The scan and sweep tables can be selected from the subdirectories for the receiver versions (K10, K11, etc).

1.3.4.1 Performing the Measurement

When preparatory operations as described under 1.3.4 are completed (required only after installation, not for recall of ES-K1 Software), the measurement task defined under 1.3.1 is performed in the following steps:

Call **Navigator** from the **File** menu. In the **Navigator** window (FIG 11), click on **Open** under **Function** and select **Scan Table** under **File Type.** Under **File Name,** select **EN55014 Voltage** and click on **OK.** The **Scan Editor** window (FIG 13) will appear.

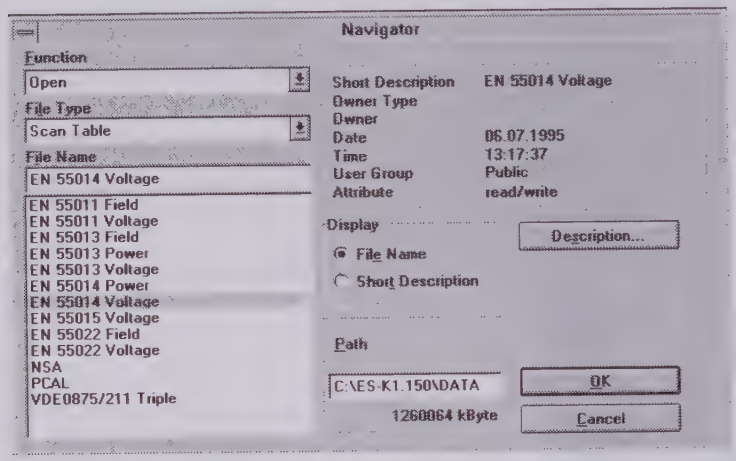


FIG 11: **Navigator** database manager selected from **File** menu. Selection of **Open** function and **Scan Table** file type. Calling of **EN55014 Voltage** file.

The **Scan Editor** window usually already contains data from previous settings. What the operator has to do is to edit the data to make the required settings for each subrange. The **Subranges** list box (upper right in FIG 16) is of primary importance. The list box will however be empty after installation of the software. In this case, proceed as described under 1.1.4.2.

It is important to note that for each subrange selected from the **Subranges** list box the settings in the **Subrange** window below are made separately, while the settings made under **Unit**, **Detector** and **Mode** above apply jointly to all subranges. It is therefore advisable to assign one of the four possible detectors (**MaxPeak**, **Average**, **QuasiPeak** and **RMS,** selectable under **Detector**) to each of the four curves (**Curve 1 to 4**). Desired detectors for the individual subranges can then be selected from the **Control** window below the **Subrange** window.

Select the desired subrange from the **Subranges** list box by means of a double click . The associated settings will be displayed in the **Subrange** window.

1.3.4.2 Editing Data in Scan Editor Window

1.3.4.2.1 Adding a Receiver

By clicking on **Receiver** in the **Subrange** window, all receivers entered in the **Device Configuration** table can be called. The selected receiver is shown with the settings stored in previous measurements displayed in the various windows under **Subrange.** Make the required settings including **Attenuation/Gain, Transducer**, **Curve 1 to 4** and **Demodulation**. Conclude settings with **Subrange Check.** Click on **Insert** (upper right). In doing so, make sure that the blue selection line in the **Subranges** list box indicates a frequency range higher than the subrange to be added. Otherwise an error message will be output. Store setting with **OK.**

1.3.4.2.2 Changing a Frequency Range

Select frequency range from **Subranges** list box with blue selection line. Double-click on frequency range to activate it. All associated settings will appear in the **Subrange** window. Change range as required and conclude setting with **Subrange Check.** If the new value does not match existing settings (eg artificial mains network above 30 MHz), the operator is prompted to make an appropriate correction. Click on **Modify** to confirm the change. Store with **OK.**

1.3.4.2.3 Deleting a Frequency Range

Select frequency range from **Subranges** list box with blue selection line. Activate range by means of single click. Then click on **Delete** and store with **OK.**

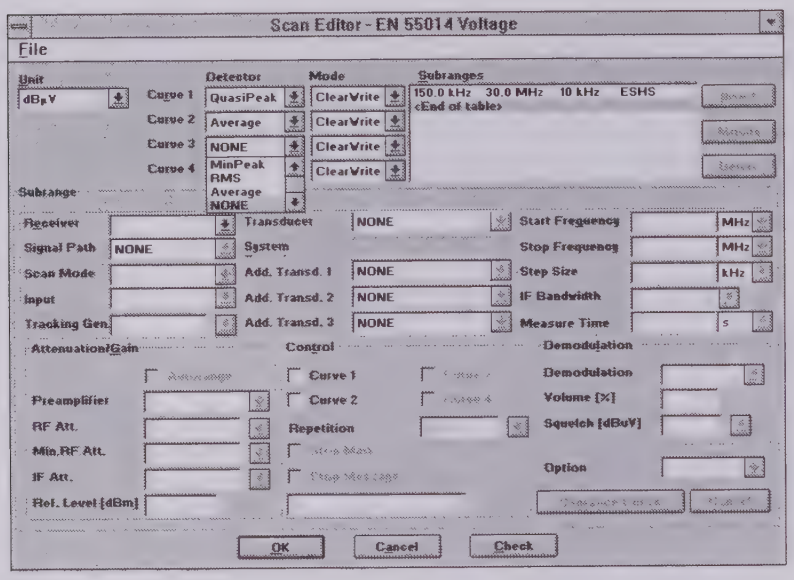


FIG 12: Scan Editor - EN55014 Voltage

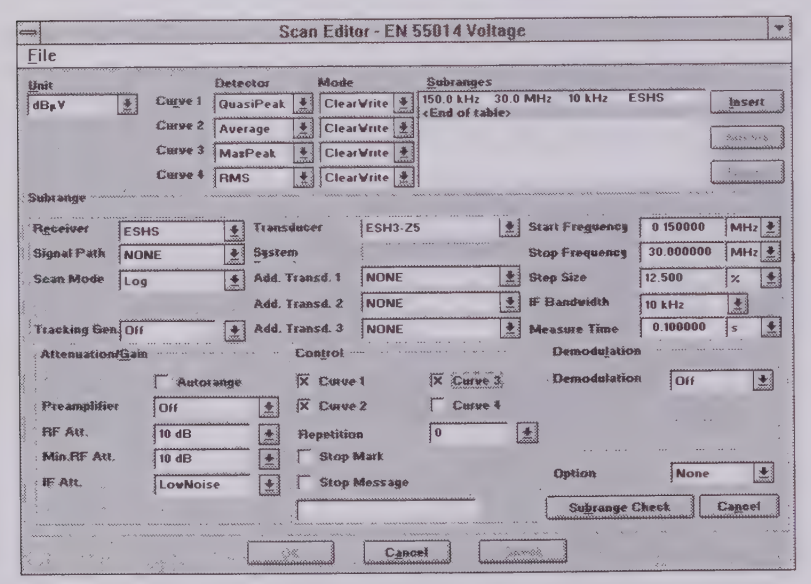


FIG 13: Scan Editor - EN55014 Voltage, after double-click on test receiver marked blue in **Subranges** list box and calling of transducer ESH3-Z5; confirmation with **Insert** in the upper right. Curve 4 (rms detector in this case) is not available for ESHS.

It should be noted that **MaxPeak** in conjunction with 10 ms measurement time will provide a coarse result for orientation only. For measurements in line with standards, the quasi-peak detector would have to be selected for curve 1, as well as a measurement time of 1 s. However, this would lead to uneconomical measurement times, so a time-saving approach (subrange analysis) is usually taken for this type of measurement.

The DUT in this measurement task is a pure broadband interferer. This means that it does not cause sinusoidal interference on just a single frequency. In this special case, it is not obligatory to measure at

each single frequency of the range but the range can be scanned in steps larger than the bandwidth of the test receiver. It is appropriate to select logarithmic steps. With a step size of 12.5%, total measurement time at each frequency will in this case be just about 1 min 40 s even for the standard-conforming measurement time of 1 s.

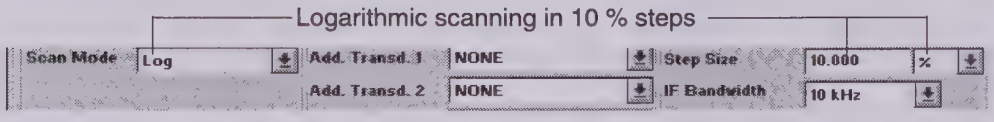


FIG 14: Selection of logarithmic scanning. It should be noted that the step size actually selectable depends on the receiver characteristics. Type ESxS and ESPC receivers allow for step sizes with a factor of $100\%/2^n$ only, ie 100%, 50%, 25%, 12.5%, etc. The nearest possible step size is set and displayed in the **Step Size** window after clicking on **Insert.** In this case, this is 12.5%.

1.3.5 Measurement

1.3.5.1 Example of Virtual Measurement

The measurement described in this section is based on the settings made in the previous sections 1.3.3 and 1.3.4. In this case, however, no hardlock is installed (virtual measurement). Results (FIG 18) are supplied by an internal function generator (simulated by the software). The measurement described is therefore suitable for demonstration.

Select **Test** from the menu line of the initial mask. From the **Test** menu, select **Measurement** and then **Scan** (FIG 19):

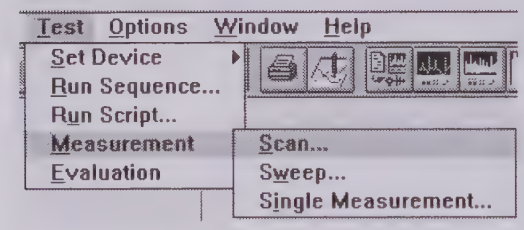


FIG 15 Calling **Measurement** and then **Scan** from the **Test** menu

Click on **Scan.** The scan settings made before are displayed (FIG 20).

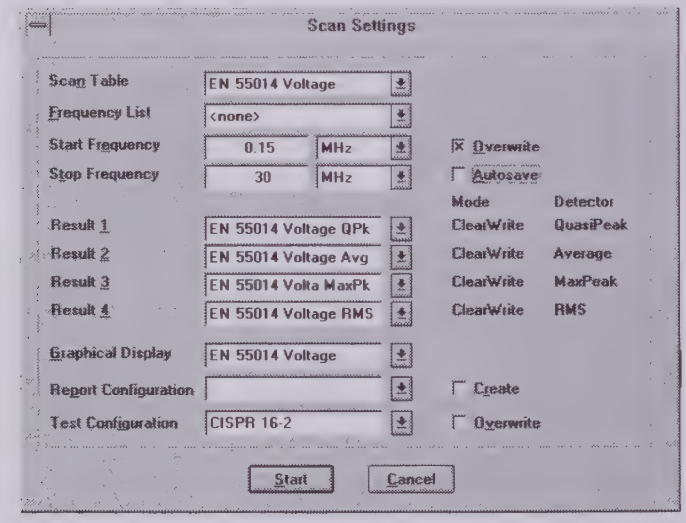


FIG 16 Scan settings. Note: No rms measurement will be performed because **Curve 4 (rms detector)** cannot be selected in the **Scan Editor** since Receiver ESHS contains no rms detector. Despite this, **Result 4** (rms value) is included in the **Scan Settings** because it is possible that a subrange not used here is used by an ESS (with rms detector), and the scan table applies to all subranges.

The measurement is activated by clicking on **Start.**

The graphics shown in FIG 18 is displayed while the measurement is being performed. The icons numbered 1 to 8 for the various curve configurations can be assigned as required to the two test curves (QP (quasi-peak) and AV (average)) and to the limit lines from the database.

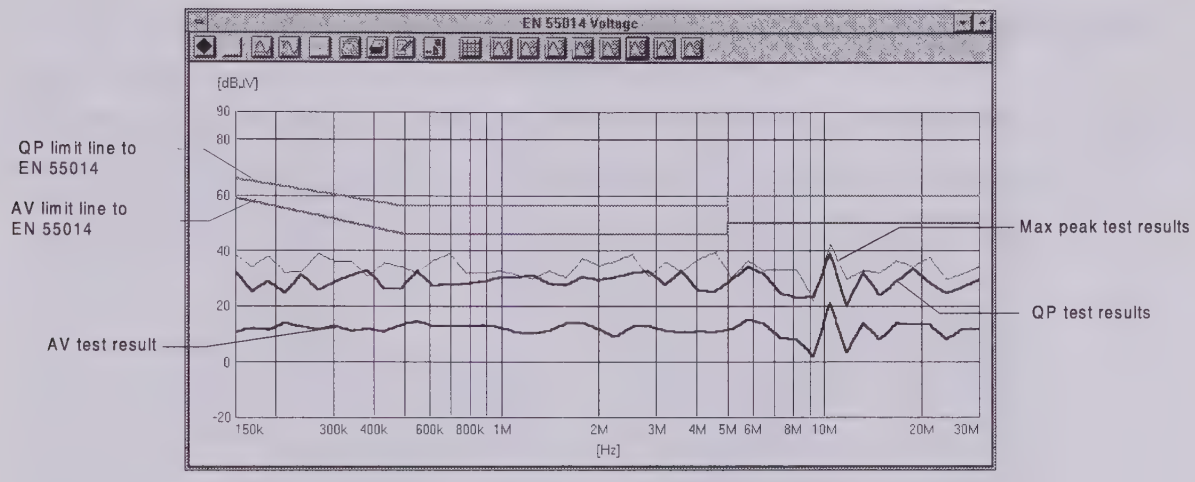


FIG 17: Display of results

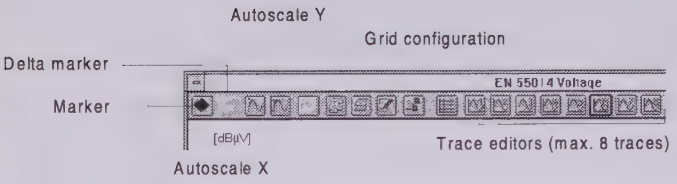


FIG 18: The line of icons above the chart is used for configuring the chart with the test curves as required. Particularly helpful is the zoom function, which is always active and operated with the lefthand mouse key. The icon is for returning to the unzoomed chart.

1.3.5.2 Practical Measurements

1.3.5.2.1 Measurement of Broadband Interferer in Range 150 kHz to 30 MHz

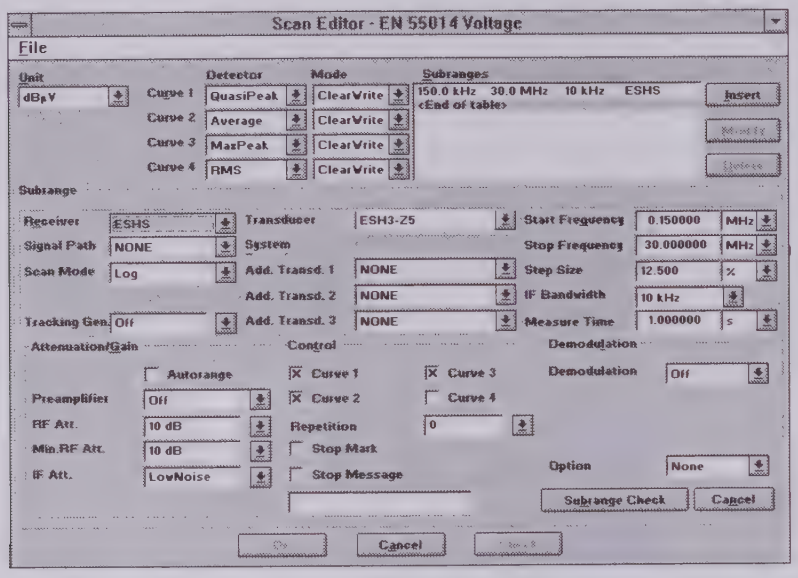


FIG 19: **Scan Editor.** Note that curve 4 is switched off in this case too because ESHS contains no rms detector.

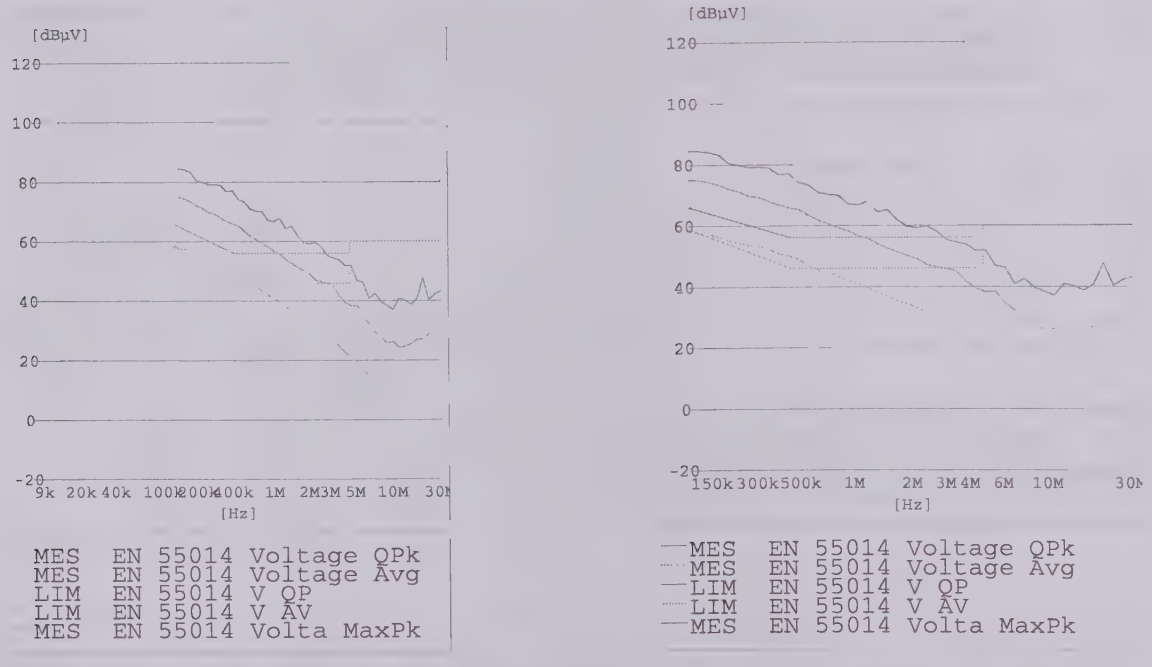


FIG 20: Display of results. Left: using graticule stored in previous measurement with frequency axis from 9 kHz to 30 MHz. Right: after clicking on "Autoscale X" icon . ESHS test sequence: QP and AV values determined in first run, MaxPeak in second run.

1.3.5.2.2 Measurement of Broadband Interferer in Range 9 kHz to 30 MHz

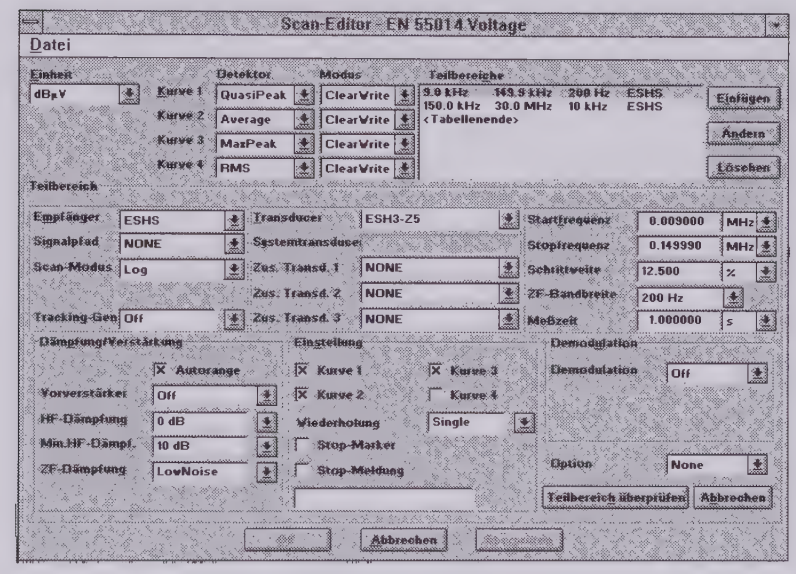


FIG 21: Note: 149 kHz is the highest frequency selectable for CISPR band A (9 kHz to 150 kHz) in conjunction with a bandwidth of 200 Hz and QP display. The program will not accept the value 150 kHz for CISPR band A with QP and 200 Hz bandwidth.

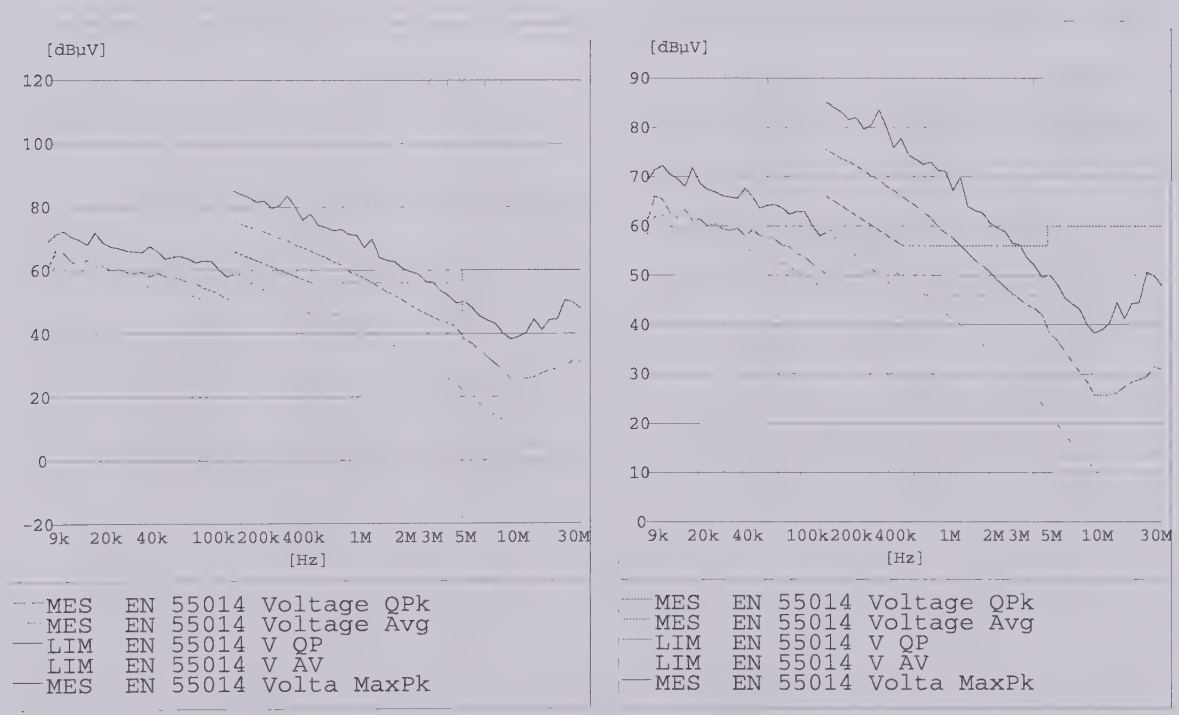


FIG 22: Display of results. Left: in default diagram. Right: in diagram with level range adjusted as required by clicking on Autoscale Y icon .

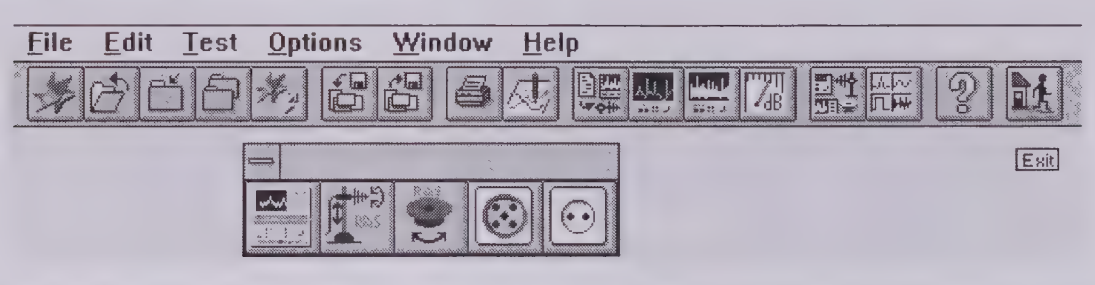
From the above figure it can be seen that the legend for the curves is printed completely on the hardcopy. On the screen, there is only one line displayed at a time; the lines for the other curves can be displayed by scrolling.

2 Graphical User Interface

2.1 Overview

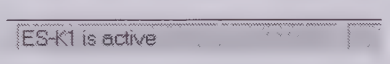
The graphical user interface is very similar to the widely used standard interface for MS-WINDOWS. This environment permits the user to perform all operations in interactive mode. The dialogs and input masks provide a complete overview of all possible settings, such as file and graphics operations, parameter settings, measuring and analyzing functions, etc. The measurement results can be easily transferred to other WINDOWS programs in tabular or graphical format.

When using the mouse (or the trackball), various functions are very easily accessible by means of the fields in the **Main Toolbar**. The same is true for the **Device Toolbar**, which permits to start the device dialogs (activation in the menu **Options)**:



As soon as the mouse cursor rests one second on an icon then an explanation is displayed next to the icon. Note: At that moment the global Windows system keys like e.g. ALT+TAB are not effective.

The **status bar** is used to display short help texts for various menu items:



The background of the main window of the application can be assigned a graphics of the WMF type (Windows Metafile Format), i.e. a vector graphics. E.g. a representation of the test setup generated with a respective graphics program could be displayed there. Any WMF file can be defined as **Background** display via a file selection window.

The graphical user interface contains the following submenus:

File
Edit
Test
Options
Window
Help

The submenus are explained in greater detail in the following chapters.

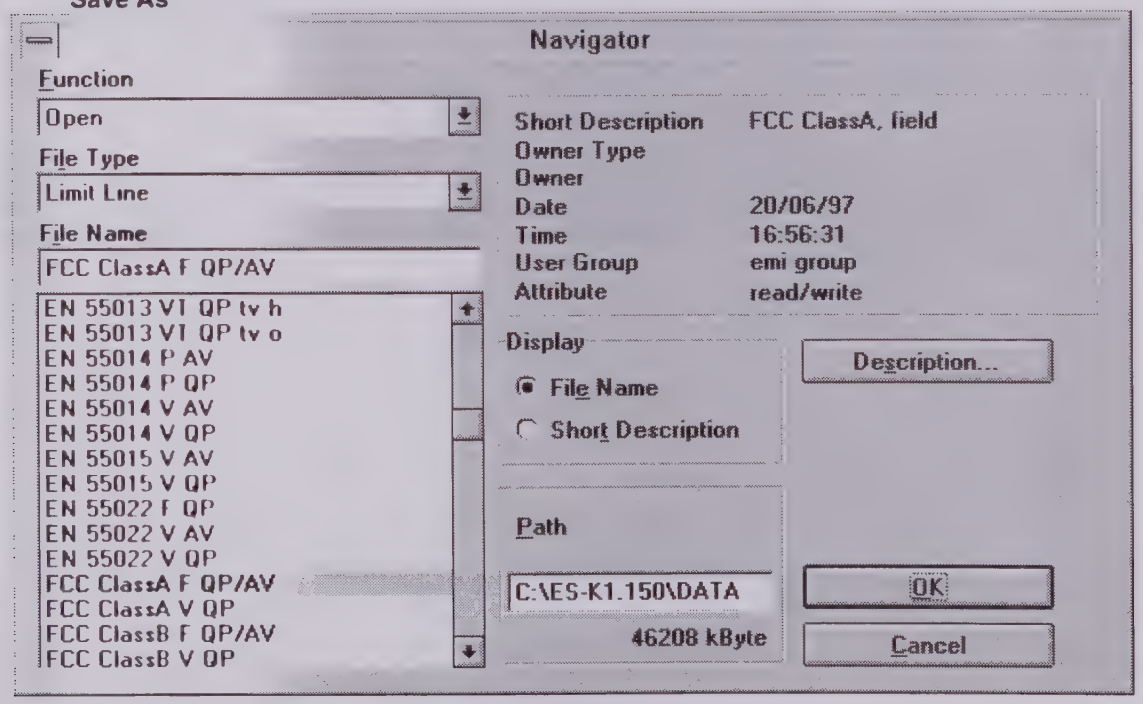
2.2 Files

The core of the software contains a local database for management of all occurring file types. This data base uses its own file names and file attributes, which are not directly derived from a DOS file system. Thus it is possible to use longer file names and any additional descriptional texts for each database element.
In the following, database elements are referred to as files, however, they are not to be understood in the sense of DOS files.
By exporting database elements, a new external database is created or extended (e.g. on a floppy disk), from where these data can be imported again at a later point in time.

File functions are selected from two **Navigators** in the **File** menu. One Navigator provides functions on the **internal** (local) database whereas the other one offers the functions on **external** (exported) databases.

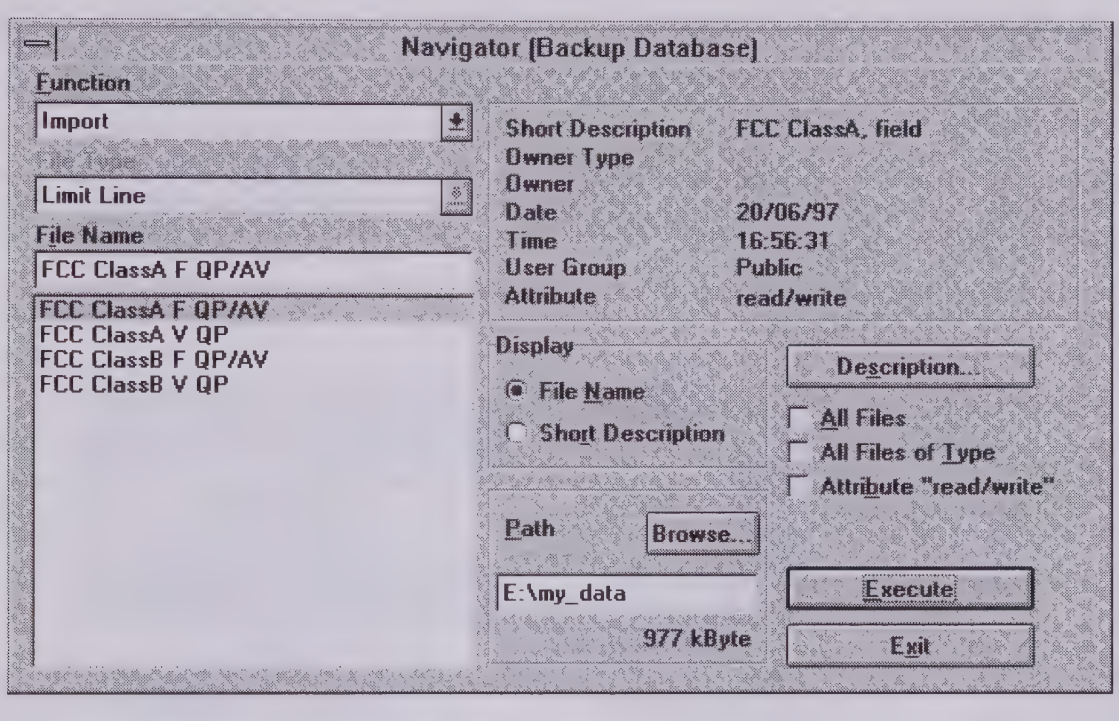
File functions on the **internal** database:

Delete
Export
Move
New
Open
Rename
Save As



File functions on the **external** database:

Delete Backup Files
Import



The submenu **New** offers all kinds of file types.

Open is possible only with files that already exist.

If a new or existing file of any file type is opened for editing then the matching editor will be automatically loaded.

If a new file has been created or modified, this modification has usually not been stored yet. Using **Save** or **Save As** the file is saved under its existing name or under a new name (in the local database).

Rename simply changes the name of a file.

Using **Delete** a file can be deleted from the local database, unless it can be modified by an editor at this point in time (e.g. an opened graphic). It is also possible to mark several files of the same file type and delete them at the same time.

The function **Export** permits to export files. To this end, a drive must be selected first. The files to be exported are marked and copied to the external database by means of **Execute**; should this database not exist yet, it is newly created there. If retention of the user name is not activated, the file is copied with the attribute Public.

Move means that files are exported and right after deleted. This way it is possible to easily archive data that are currently not being used, e.g. onto a server.

The function **Import** permits files to be copied from external databases to the local database. To this end, a drive must be specified and the required file type selected (depending on the contents of the external database). The individual files can then be marked and imported using **OK**. A prompt protects against unintentional overwriting of the files in the local database.

For **Import** the drive and the directory path can be set by making use of the **Browse...** dialogue. The total pathname will be shown in a text field.
The same is true for **Export** and **Move**. With these functions the pathname can also be edited. If the given path doesn't exist then it will be automatically created with the first file transfer.
Note that the maximum length of the path must not exceed 37 characters.

Export and **Move** can optionally be done in a way so that all transferred files in the external database will have the file attribute *'read only'* thus automatically protecting those files against overwriting. On the other hand **Import** can change the file attribute of all transferred files to *'read/write'* thus enabling immediate editing of those files.

Besides, with **Export**, **Import** and **Move** either all files of the current filetype or the whole source database can be selected for the transfer. This way a complete backup can easily be done (also see filetype 'Test Configuration').

The menu item **Delete Backup Files** is used to delete specific files in an external database (i.e. exported files).

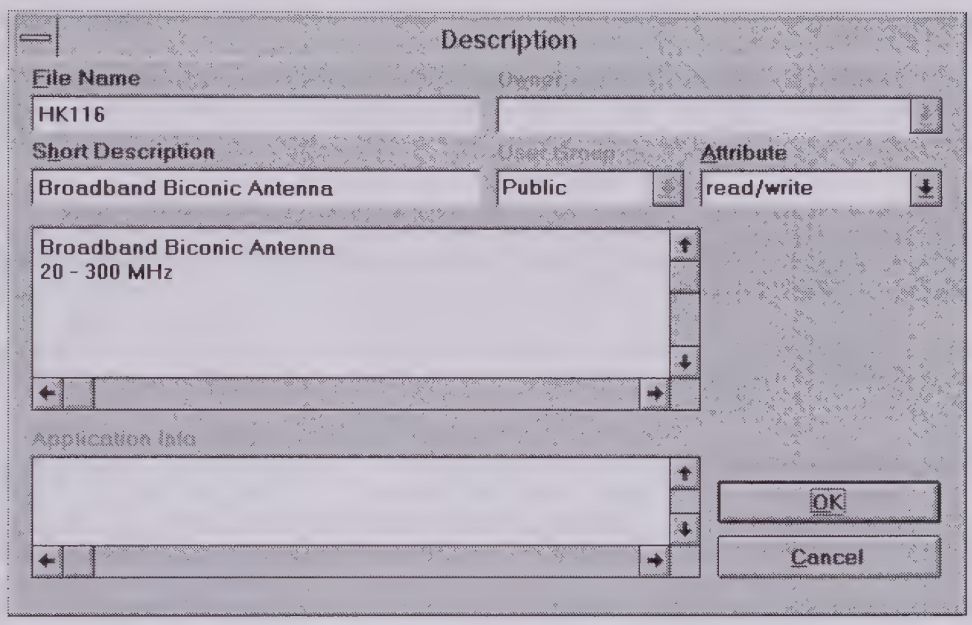
The following table shows all available **File Types** including their function:

File type	Function	Editor
Sequence	A sequence of scripts	Sequence editor
Script	An automatic test procedure	Script editor (can only be operated with option ES-K2)
Script Parameters	Definition of script parameters	Script parameter editor
Measurement result	Display of measurement results	Table editor
Graphics configuration	Definition and display of graphics	Graphics configuration editor
Limit line	Definition of limit line	Table editor
Transducer	Definition of probe transducer (e.g. for antenna, absorbing clamp)	Table editor
System transducer	Definition of system transducer (e.g. for cables, paths)	Table editor
Report header	Definition of report header	Report header editor
Report configuration	Definition of report configuration	Report configuration editor
Scan table	Definition of scan table	Scan editor
Sweep table	Definition of sweep table	Sweep editor
Frequency list	Definition of frequency list	Table editor
Test configuration	Definition of files belonging to a test	Test configuration editor
Text file	Definition of a description text	Text editor

The associated files are displayed in the selection window **File Name**. When a file is selected (when a letter is entered, the mark slips to the first file with the same intial, if provided), file-specific information is output in an extra field. This information is user-defined and can be edited by clicking on the key **Description** (see below).
In a further field, the drive (belonging to the local database) and the available storage capacity are displayed.

OK is used to check the entries; when a file is created or opened, the respective editor is loaded. **Abort** closes the dialog window without saving the settings.

The key **Description** permits to edit specific file information. The following dialog window appears on the screen:



The user may enter the purpose of the file in the editable field **Short Description.** For a detailed description, use the input field below.

The access status of the file ("read/write", "read only", "not removable") can be set in the window **Attribute**.

The window **Owner** refers to a fixed reference of the respective file, at the moment only for script parameter sets. It indicates with which script the respective parameter set is connected.

In the text field **Application Info** the user name of the original user of the file is additionally recorded; this text field cannot be edited.

With **User Group,** the file is either assigned to the user group which includes the original user of the file, or defined as "Public", i.e. generally accessible.

OK is used to check and save the settings, **Abort**, on the other hand, ignores them; in both cases, the window is closed.

Close (menu **File**) is used to close an open text file or graphics configuration, which means that it is no longer available for processing for the time being. If the file has been modified, the user is asked whether he wishes to store the modifications in the file. Without storage, the modifications will be lost for good.

2.3 Filetypes

2.3.1 Script

A script constitutes an automatic program run which is controlled by the program text (FSL = Flexsys Script Language; similar to the programming language PASCAL) (Interpreter). Thus, almost all functions that are accessible in interactive mode can be automated so that even complex measurement runs can still be operated and reproduced.

Generation or modification of a script is performed by the script editor of the script development environment (Option ES-K2); it also permits to execute scripts in single steps and inspect variables (debugger).

2.3.2 Script Parameters

A script can be assigned parameters. The script parameters can be edited directly or when the script is started and can be stored as a complete parameter set. Various parameter sets can be created for each script that uses script parameters. During execution of a script, all parameters are constant, i.e. they cannot be changed any more.

2.3.3 Sequence

A sequence describes a sequence of automatic program runs or scripts. If the individual scripts are executed without user interaction, very complex measurement tasks can thus be handled fully automatically.

2.3.4 Measurement Result

A measurement result (trace) consists of a list (thousands of lines are possible) with columns for frequency and level. A measurement result is produced by functions such as scan or sweep, which is why the name of the respective scan or sweep table is also recorded internally.

2.3.5 Limit Line

Complying with a specification, limit lines are frequency-dependent maximum values for measured values, displayed as lines. They are defined as frequency/level pairs, the level being assigned the required unit.

2.3.6 Transducer and System Transducer

Since the measuring instruments only measure the voltage at the input, the measured values must be corrected in order to take into account the frequency characteristic of sensors and cables.
The (probe) transducer describes the frequency-dependent correction (represented as frequency/level pairs) of sensors, i.e. antennas, current probes, etc., the associated level unit (dBµV, dBµA, dBµV/m, etc.) having to be specified for the transducer.
System transducers, on the other hand, are correction values (frequency/level pairs) with the unit dB, defining the frequency-dependent characteristics of cables, amplifiers, attenuators, power dividers, etc.

2.3.7 Graphics Configuration

A graphics configuration describes the appearance of the graphics (always level versus frequency). Thus frequency range and level range are defined on the one hand and the elements to be displayed such as traces, limit lines, transducers with type of display and colour on the other hand. Furthermore, marker, deltamarker or legend are determined here.

2.3.8 Report Header

The report that is part of the test typically contains various specifications that are relevant to the test. This includes e.g. test conditions, test site, designation of the EUT or name of the user. This information is recorded as report header.

2.3.9 Report Configuration

For generation of a test report, a report configuration is used, which permits to vary the appearance of the report. It permits to define a combination of e.g. report header, graphics and measurement results which is to be included in the printout with this report configuration.

2.3.10 Scan/Sweep Table

A scan or sweep is used to record a section of the frequency spectrum.
In the case of a **Scan**, the test frequency is repeatedly increased by the defined step size (or, as an alternative, set to the next frequency of a frequency list), and a (peak and/or average) level is measured until the end of the specified frequency range has been reached. Depending on the specifications, a single sweep may contain thousands of test points. A scan is usually a time-consuming procedure, however, it permits to measure the spectrum in detail.
Contrary to this, a **Sweep** (only with analyzers) permits fast measurement of the spectrum (only with the PEAK detector): the spectrum is also measured completely, however, with a limited frequency resolution of e.g. 900 pixels per sweep. This resolution is usually not sufficient to analyze the spectrum thoroughly.
Sweeps therefore constitute an appropriate means for obtaining a fast overview of the spectrum, whereas scans are required for a detailed analysis, not least because of the detectors defined in the specifications.
All test parameters required for a scan or sweep - e.g. the setting of the attenuation, test bandwidth or correction values to be used - are defined in a scan/sweep table which must always be selected for such a measurement run.

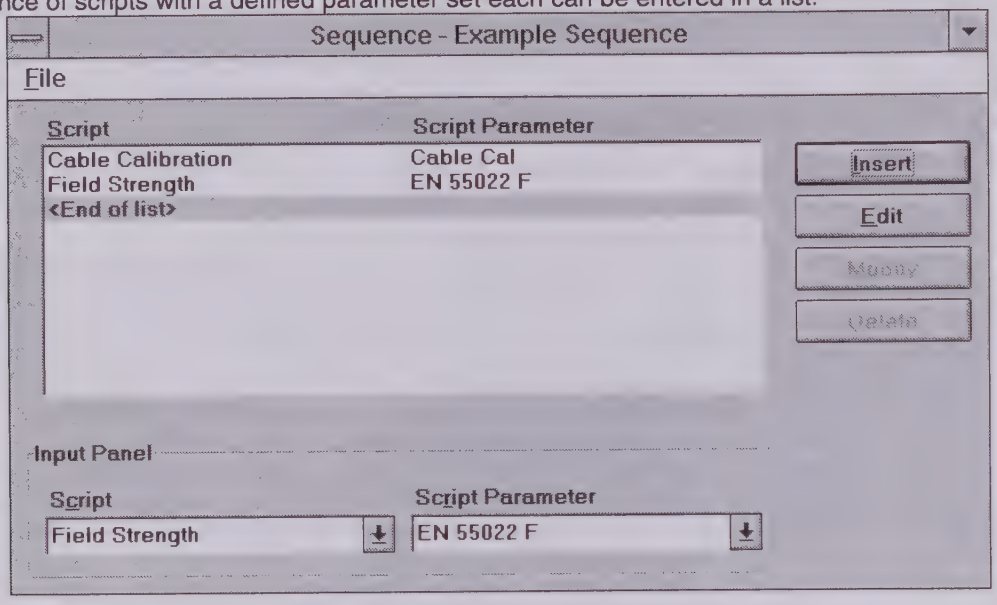
2.3.11 Frequency List

A frequency list serves various purposes. It may be used, e.g., to display a list of ambients at an open-area test site, but also to list critical frequency points of a EUT, which are to be measured by means of a frequency list scan.

2.4 Editors

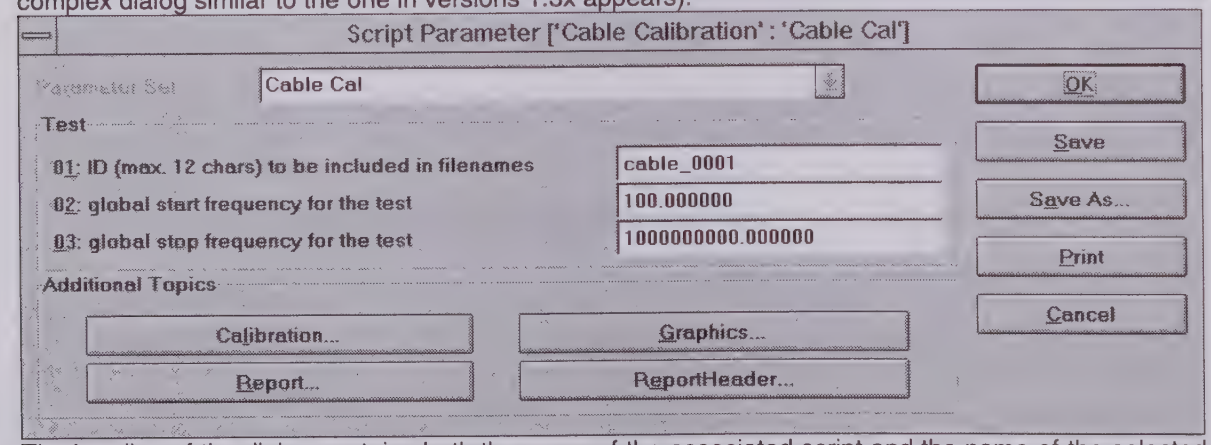
2.4.1 Sequence Editor

The sequence editor is used to define a sequence for execution of the scripts.
A sequence of scripts with a defined parameter set each can be entered in a list.



2.4.2 Script Parameter Editor

If a script parameter set or a script containing script parameters is opened, the following dialog is displayed (only with extended syntax for the parameter definition; without extended syntax, a less complex dialog similar to the one in versions 1.3x appears):



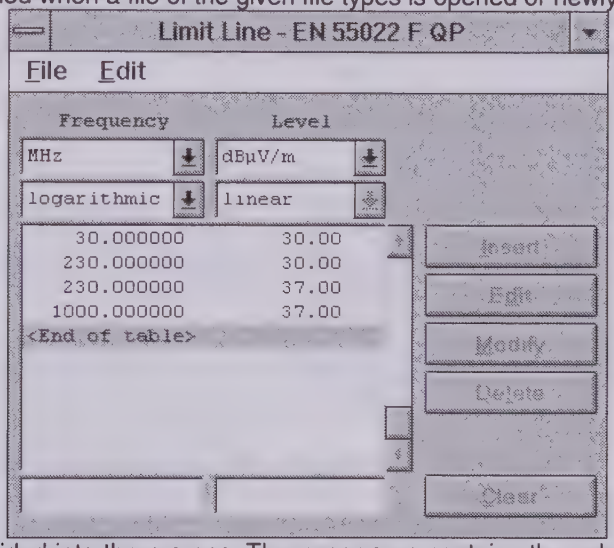
The heading of the dialog contains both the name of the associated script and the name of the selected script parameter set. The parameter set to be used is set using the selection menu at the very top of the dialog window. The main parameters are shown below, the short description at the left and a select or edit element at the right. In the lower area of the dialog, additional keys for further topics can be offered depending on the syntax of the associated script. Thus, further groups of parameters are accessible.

The total script parameter set can be stored (maybe under another name) or printed out by means of **Print**. If a script has been started, it is actually only run after the dialog has been left (the last modifications are saved using OK or ignored using Cancel), unless the run is interrupted by means of the additional **Stop** key.

Notes:
If a new parameter set is to be created using **New...**, an existing script must be defined as **Owner** in the dialog **Description...**.
If new parameters are added to a script, the old parameter set remains compatible. The additional parameters are assigned their standard values.
If parameters are deleted from a parameter set, the parameter set can still be used.
If a script is deleted, all parameter sets assigned to the script are deleted as well.

2.4.3 Table Editor

The table editor permits the user to generate or modify frequency lists, limit lines, measurement results, probe transducers and system transducers.
The editor is always loaded when a file of the given file types is opened or newly created.

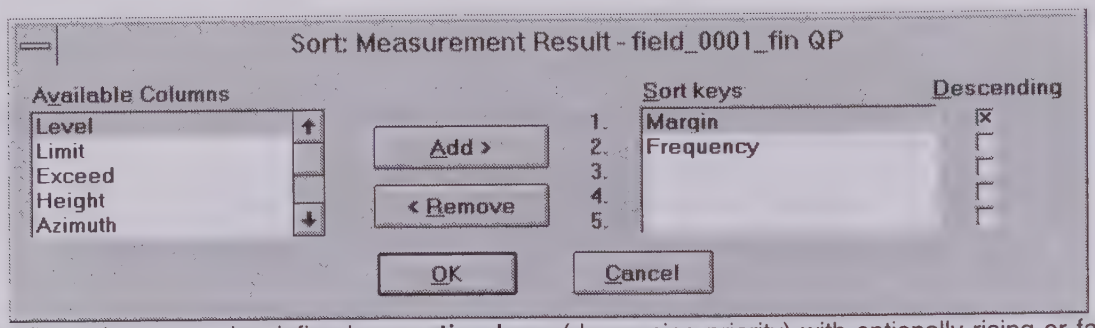


The dialog window is divided into three areas. The upper area contains the selection window, where the user may define e.g. units. The table contents are displayed in the middle area. The lower area contains input fields.

The frequency unit is always offered, whereas a level unit is not available for frequency lists. The intermodulation mode for the frequency can be set to linear or logarithmic for limit lines and transducers (interpolated lines with linear or logarithmic display). The source unit is always dBµV (in the case of transducers), the correction level unit is always dB for system transducers.

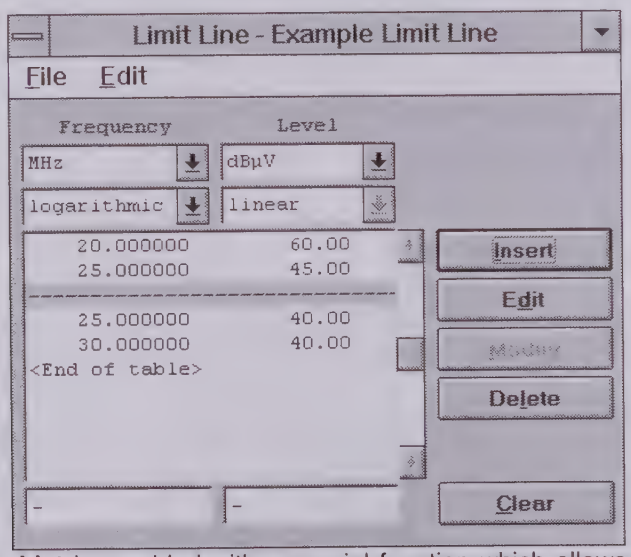
The lower input fields permit to enter new lines, which can be inserted into the list ahead of the active line using **Insert**. As an alternative, the active line in the list can be overwritten by means of **Modify**. **Edit** (or a double-click) permits to copy the contents of the active line into the input fields. The active line can be removed from the list by means of **Delete**, which causes the next line in the list to become active.
Copy permits to copy the complete contents into the clipboard. If particular lines have been selected (marked), only these are copied. Thus data can be very easily transferred to other applications.
The menu item **Print** permits the complete list to be directly output to the printer without the need for a report configuration.
The **column layout** can be extended (**Add Column...**) or modified (**Modify Column x...**) in various ways: Up to ten columns can be represented, the elements of which can be edited almost at will (the file types limit line, transducer and system transducer require rising frequencies). Added columns can again be deleted "from back to front" (**Delete Column**). The longer one of the two headings determines the width of the column. Possible file types are floating-point numbers, integers or character strings (max. 15 characters); a large number of physical units is available for the unit of numerical values.

For **Sorting** of lists (only for file types measurement result and frequency list), a very flexible window dialog is available:

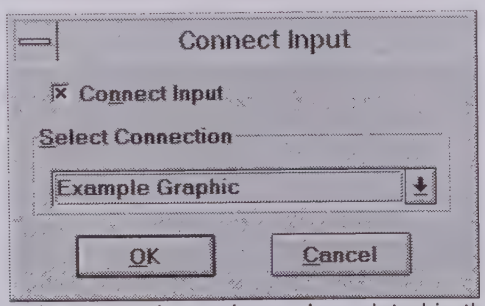


Up to five columns can be defined as **sorting keys** (decreasing priority) with optionally rising or falling values for the elements. Measurements which are not sorted with rising frequency, however, should not be displayed with line graphics display, since the sequence in the list is valid for the graphics.
The columns described in the left field can be selected individually and entered or added as sorting criterion by means of **Add**. Likewise, they can be removed again by means of **Remove**, the subsequent entries being shifted accordingly.
Sorting is always accomplished with falling values if the associated select box has been marked, otherwise, rising values are used. **OK** starts the sorting procedure.

The file type **Limit Line** also permits to define gaps by entering just a minus sign into the edit fields for frequency and level:



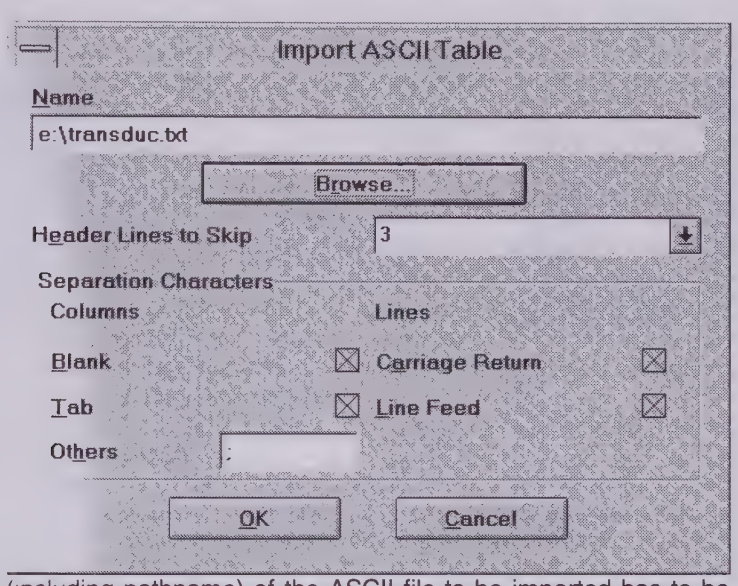
The file type **Frequency List** is provided with a special function which allows comfortable editing of a frequency list: **Connect Input...** determines from which of the opened graphics the marker frequency is to be transferred to the edit field:



If there is such a connection, the frequency is continuously updated in the edit field of the frequency list when the marker is shifted.

Data lists are often available as files. For example, ever more antennas are delivered along with a floppy disk that contains the correction factor as a DOS (text) file in an ASCII format. Such a list can be easily transferred into the ES-K1:

When creating a new table file (transducer, system transducer, limit line, measurement result list, frequency list), then the empty columns (including those that are added) can be filled with the content of the ASCII file. Before starting the import, the units for frequency, level, etc. have to be selected according to those in the ASCII file. By selecting **File => Import ASCII Table...** the following dialogue comes up:



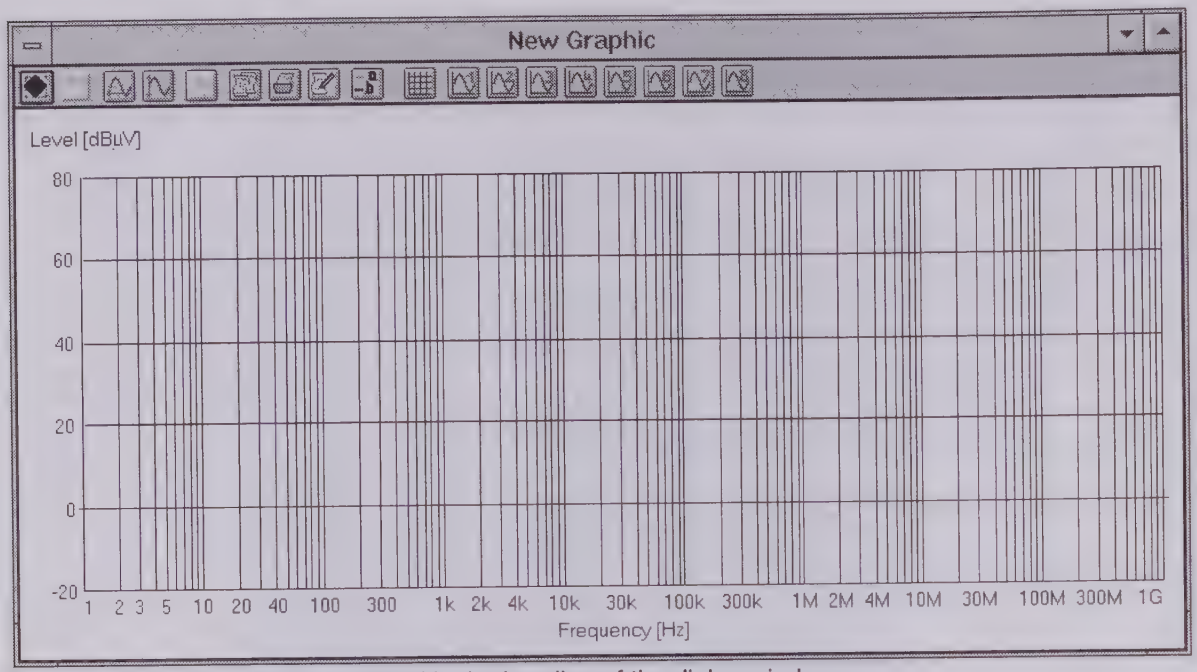
The DOS filename (including pathname) of the ASCII file to be imported has to be entered in the field *Name*. Alternatively the file can be searched in the file system by pressing **Browse...** . The number of header lines to be skipped enables to ignore those lines that include header information - therefore a modification of the ASCII file is not necessary.
The type of separators between numbers as well as between lines has to be defined. Separators between numbers are blanks (spaces), tabulators or any other user defined character; carriage return or line feed can be selected as line separators. Characters that cannot be part of a number will be ignored until a valid field separator will be found. For example, a line like

```
+5.6789E+007MHz    +2.345E+001dBµV/m    3:45p.m.
```

will be correctly be interpreted if there is an extra string column defined.
If a column within a line cannot be filled then this will be indicated with an asterisk.

2.4.4 Graphics Configuration Editor

This editor permits the user to generate or modify a graphic. Graphics are used for presentation of the measurement results. To this end, a number of functions such as Zoom, Marker, Legend and Element configuration are available.
If the editor is loaded via **New...**, a standard value is assigned to each element and a standard graphics appears on the screen.

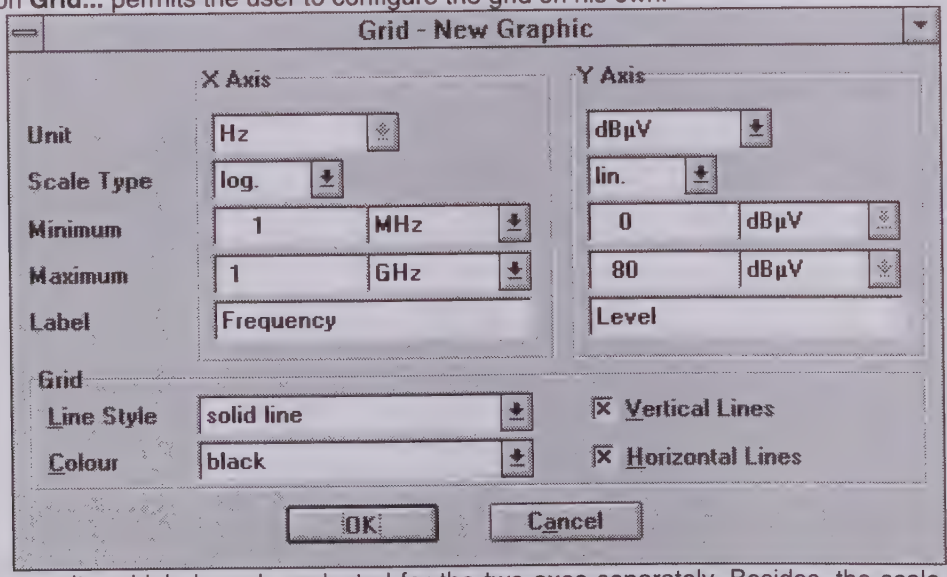


The name of the graphic is indicated in the heading of the dialog window.
The dialog window is divided into two areas. The upper area contains the function bar for configuration of the graphics elements. Up to 8 trace elements can be edited independently of each other. The lower field displays the configured graphics. A complete graphics configuration comprises the elements grid, traces 1 to 8, marker and legend.
All graphics settings are accessible via the menu item **Edit**.

The status information on marker and delta marker are then displayed in the graphics window above the diagram.

Grid

The function **Grid...** permits the user to configure the grid on his own.

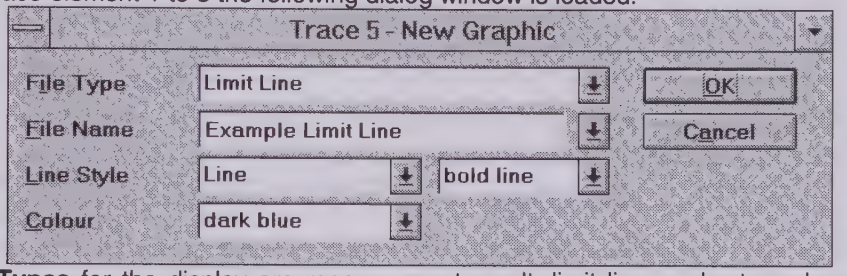


Value range, unit and label can be selected for the two axes separately. Besides, the scale type of the X-axis may be defined as linear or logarithmic, whereas the Y-axis is aways linear. In addition, the dialog permits to set the colour of the grid as well as to fade out the horizontal or vertical lines.
The frequencies of a diagram can easily be modified through shortcuts for the frequency units. A frequency of e.g. 300 MHz can be entered as *300M* .

The line style of the diagram grid can be selected. A doted line for example makes it easier to recognise horizontal limit lines as well as harmonic signals from a quartz oscillator.
The (linear or logarithmic) display of voltages is also possible.

Trace ...

Using the function **Trace *x*...** the user can determine the graphics configuration on his own. When selecting the trace element 1 to 8 the following dialog window is loaded:



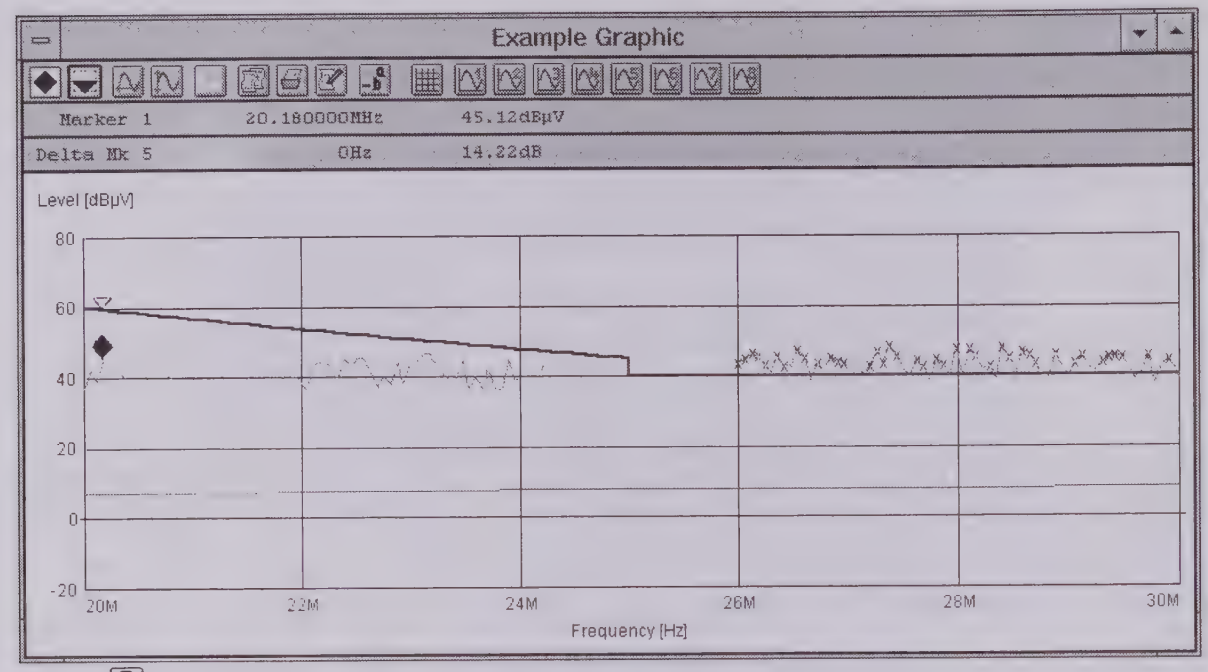
Possible **File Types** for the display are measurement result, limit line, probe transducer and system transducer. The appropriate file is selected in the field **File Name**; the trace can only be displayed if the level unit corresponds to that of the diagram.
The alternative type of trace "constant" is used to display a horizontal line; instead of a file name, the associated level will be entered then.
The line style and the colour can be set for each trace; various options are possible for line and dotted display.
Note: The active traces are always drawn „from back to front", i.e. trace 8 is always at the very bottom (but still on the grid), trace 1 is always at the very top.

Autoscale X , **Autoscale Y**

Automatic scaling of the graphic - for the two axes separately - leads to a complete display of all displayed traces. The associated value range of the grid is changed accordingly.

Marker , **Deltamarker**

The functions **Marker** and **Deltamarker** permit the user to position two markers in the graphics for interactive graphical evaluation of the measurement results. First, the marker is activated and positioned. Then, the deltamarker can be added; however, it cannot be used without the marker.
The status information on marker and deltamarker is indicated inside the graphics window above the diagram. The markers can be shifted using the mouse or the *Cursor keys Left* and *Right*. If the mouse is used, the active marker can be moved by selecting the marker with the left mouse key and shifting it to the new position with the mouse key depressed. When using the cursor keys Left and Right, the marker is shifted in the desired direction on the trace. The speed at which the marker is moved can be increased by means of the key combination *Ctrl + Cursor key left / right*. If **Pixel Mode** is activated, the markers are not shifted on the trace points, but in the pixel grid of the graphics display. The function **Marker Coupled** synchronizes the deltamarker to the marker. The currently active marker can also be set to a particular frequency using **Set Marker...** (*Ctrl + M*) or to the maximum of the examined trace using **Marker -> Max** and to the minimum using **Marker -> Min.** If more than one trace element is displayed, the markers can be set to the next trace element using **Next Trace** or **Previous Trace** or by means of the cursor keys Up/Down.



Zoom

The function **Zoom** permits the user to enlarge any section of a graphics area. The area is selected by pressing the left mouse key and shifting to the opposite corner with the mouse key depressed. After releasing the mouse key, the zoomed part of the graphics is displayed on the screen. Zooming is possible several times. If the zoom is active, the function symbol is emphasized and permits to return to the original display. Zooming enables to achieve better presentations, however, it is not taken into account when the graphics configuration is saved.

Copy

A graphic can be copied to the clipboard with all included elements. It is not copied as a rigid pixel graphic which requires a lot of storage capacity, but in a more complex and flexible WINDOWS-internal vector format. The memory requirements are dependent on the contents of the diagram.

Print , **Plot**

If a printer driver has been installed for printing or plotting, a diagram can also be directly output as a whole-page graphic without the need for a report configuration.

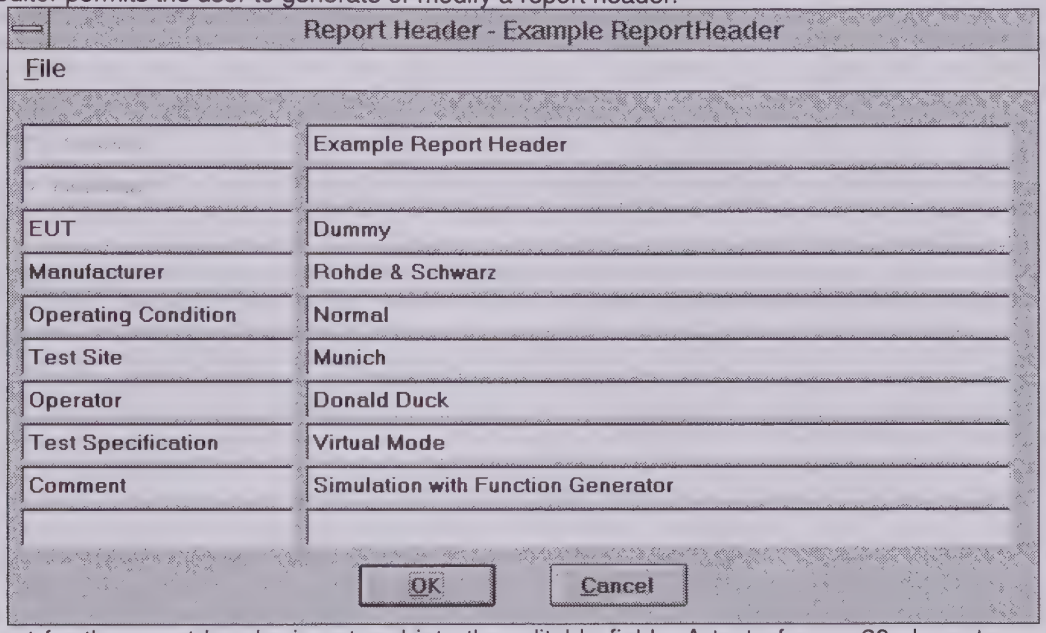
Legend

The function **Legend** provides a short description of the displayed trace elements.
Both the line style (short designation) and trace name are indicated for a trace element. It is possible to change to the next trace element by clicking on the arrow keys. The key can then be switched on or off; if it is switched on, the function symbol is emphasized.
The following short forms are used:

LIM	Limit line
MES	Measurement result
XTP	Probe transducer
XTS	System transducer.

2.4.5 Report Header Editor

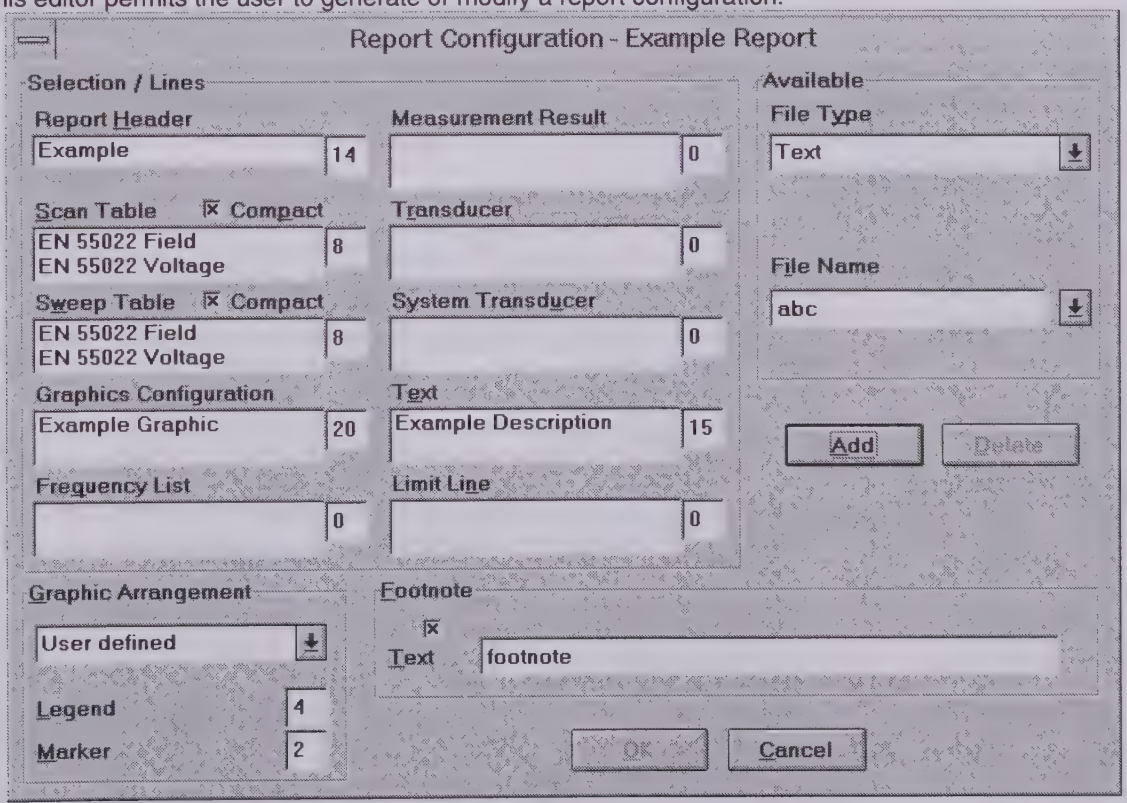
This editor permits the user to generate or modify a report header.



The text for the report header is entered into the editable fields. A text of max. 20 characters can be entered in the left column, a text of max. 50 characters in the right column.

2.4.6 Report Configuration Editor

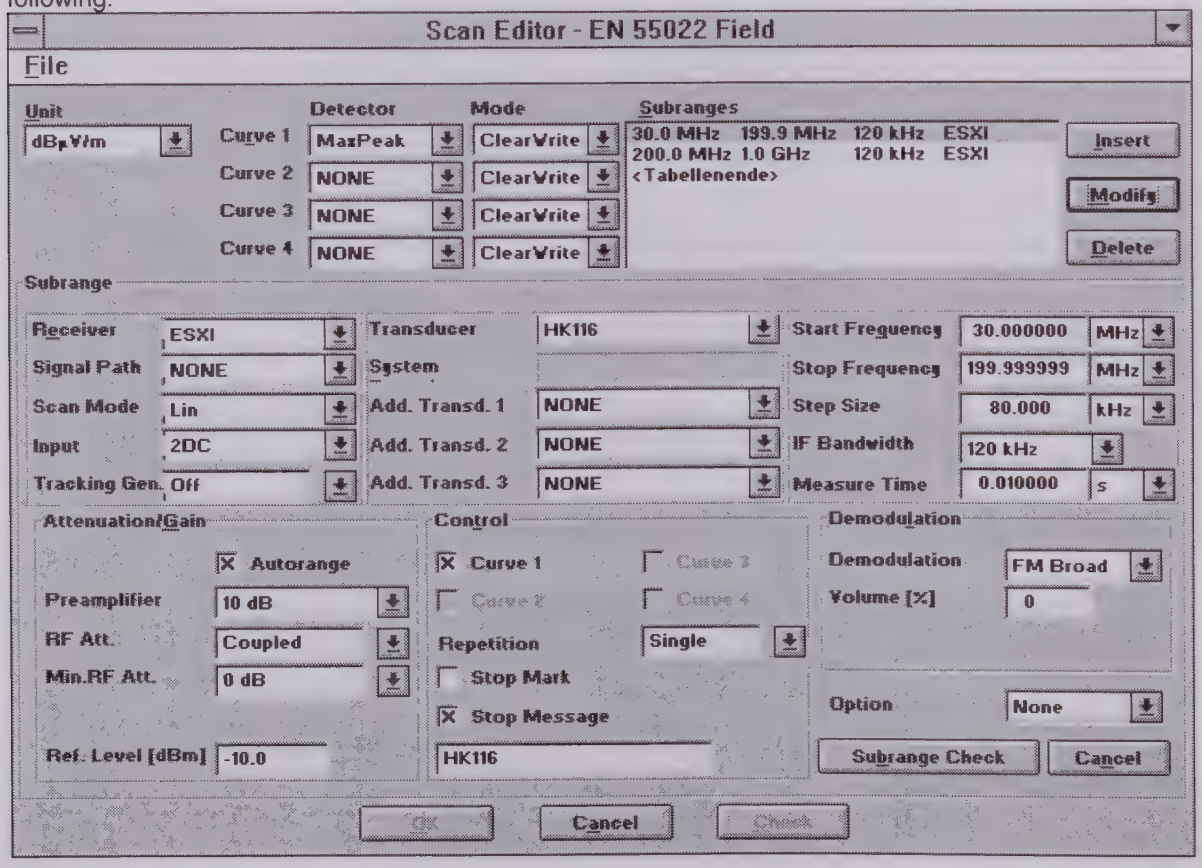
This editor permits the user to generate or modify a report configuration:



The actual configuration is indicated in the „Selection“ field, whereas the individual elements can be selected in the „Available“ field.
The entries for the "selection“ are performed by means of **Add**. Each element (report header (max. 1), scan or sweep table (max. 16 each), graphics configuration (max. 2), measurement result (max. 16), probe or system transducer (max. 4 each), limit line (max. 4)) is determined in the selection windows File Type and File Name in the "Available" field. An element selected in the „Selection“ field can be removed using the **Delete** key.
The **Graphic Arrangement** can be set such that the diagrams are arranged half-page, at least half-page until the end of page or whole-page.
Besides, all pages can be provided with a **footnote** consisting of date, time and a predefined text (max. 40 characters).
The layout of the test report can be defined to a certain extent.
For each part of the test report (e.g. report header, graphics, result list) a number of lines can optionally be reserved. A value of '0' means no reservation, i.e., the number of printed lines simply depends on the content of the referring part. If a number of lines is given, then exactly this number of lines will be printed, which means that depending on the content of the current part there will be either empty lines at the end or some lines may be cut off. The legend and the marker of a graphics diagram are handled separately from the diagram, i.e., the graphics diagram can be printed in a reproducible size. Scan and seep tables can optionally be printed in a compact format (the main parameters in a single line per range and per detector).
The most recently defined layout will automatically be used as a default for a new report configuration. When starting a printout with a report configuration then the content as well as the report header selected inside can be edited (a shortcut for editing).

2.4.7 Scan/Sweep Editor

These editors permit the user to generate or modify a scan or sweep table. Such a table determines the settings of the test receivers used for performing the scan/sweep.
The two editors are very similar, so that the differences will only be mentioned if required in the following.



The dialog window is divided into two areas. The upper area displays the general settings of the scan table. The settings of a selected subrange are indicated in the lower area (the appearance of the dialog varies according to the selected receiver). For modification, the selection can be made by a *double-click* on the selection window **Subranges**. The subranges (max. 30) can be edited independently of each other.

Note:
The frequency ranges of the various subranges must not overlap. The frequency ranges must be arranged in increasing order.

When a new table is created, the appropriate **unit** for the level and all required **detectors** (only peak in the case of sweeps) are determined first. The **detector mode** MaxHold (maxima reduction) only makes sense in conjunction with multiple scans/sweeps, otherwise the mode ClearWrite (overwrite) is used.
Subsequently, the **subranges** defined in the lower area can be lined up by means of **Insert** or subsequently overwritten by means of **Modify**. By double-clicking on an existing subrange, the associated parameters are transferred into the lower area.
For definition of a subrange, the appropriate **receiver** must be determined first, which causes the remaining fields to be adapted to the facilities of the hardware and be assigned standard values.
The probe transducer must comply with the subrange with respect to frequency range and level unit, but it can also be set to *NONE* for the time being. If various switching paths have been defined by means of the RSU superhandler, they can be selected as **Signal Path**, a **System Transducer** defined to this end being displayed to the right (grey, i.e. cannot be changed). Up to three **additional system transducers** for cable attenuations, etc. can also be activated.
Settings for the **scan/sweep mode** and for the receiver input used are also dependent on the hardware, e.g. in the case of the **Tracking Generator,** which is only required for measurements on four-terminal networks.
The fields for the **start and stop frequency** are to be defined such that the selected transducers match the frequency range. Note that the settings of the next subrange are valid for the stop frequency if this stop frequency is identical with the start frequency of the next subrange.
A **step size** can only be entered for scans; normally, it is determined by the IF bandwidth (factor of approx. 0.5 to 0.7).
The **IF bandwidth** (resolution bandwidth), in turn, results from the specification; in the case of sweeps, the video bandwidth may also be set.
The **measuring time** (for scans) or the **sweep time** is also dependent on the IF bandwidth, but also on the detectors used.
The settings for **attenuation/gain** are dependent on the device used, of course. In particular in the case of analyzers, note that the signal levels to be expected lie within the dynamic range. In the case of scans, this can in most cases be achieved by activating the **autorange** function, which causes the attenuation to be matched accordingly as soon as the signal exceeds the dynamic range.
Usually, **demodulation** of the test signal is only of interest for single measurements which are based on a scan table.
In the case of analyzers, measurements according to the standard require the use of the **Preselection**.
The entries made for **Setting** control the procedure. On the one hand, it is possible to determine which of the preselected detectors is to be used in the current subrange, on the other hand, a multiple scan/sweep (**repetition**) can be defined, i.e. instead of "Single" any multiple or even "Continuous" (must be aborted explicitly), which is also possible in combination with maxima reduction for the detector. In the case of a few receivers, this may be performed by the device itself (**Repetition by device**), which accelerates the procedure, however without updating the graphics.

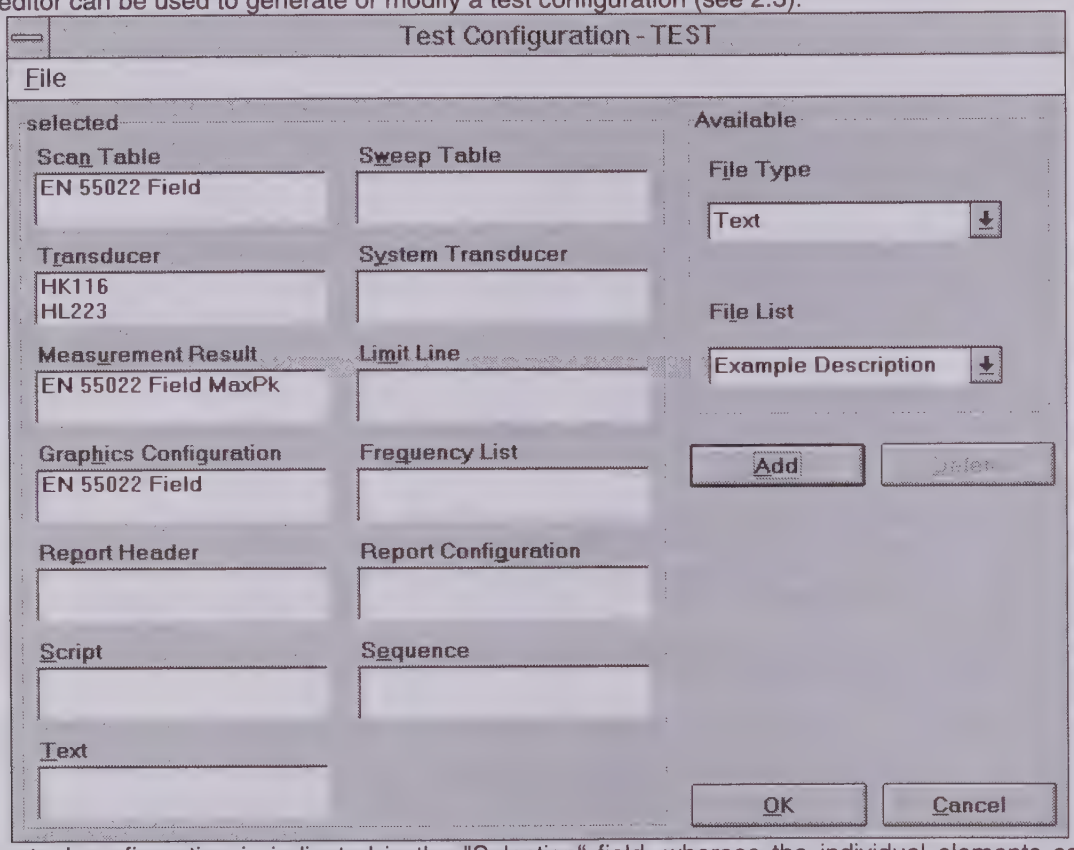
If the procedure is to be aborted when changing from one subrange to the next, e.g. in order to be able to mount another antenna, the **stop mark** must be activated. Thus, the procedure is stopped before this subrange is executed and must be continued by the user (or, as an alternative, be aborted for good). In addition, a **stop message** can be activated, so that the entered text (up to approx. 15 characters) is also output; e.g. a prompt to mount a particular antenna may thus be output.

Check subrange is used to determine whether the specifications for the subrange are consistent. Then the subrange can be transferred to the list of all subranges (appropriate position must be preselected) by means of **Insert** or **Modify**; the table will be definitely stored when the dialog is closed with **OK**.

A scan or sweep table can also be defined with voltage as the measurement unit, a non-level unit. In this case the transducers works as a linear factor (levels: the transducers are simply added to the raw reading). Any additional system transducers (e.g. a cable loss or a preamplifier) can still be included (as with levels) through the normal level definitions.

2.4.8 Test Configuration Editor

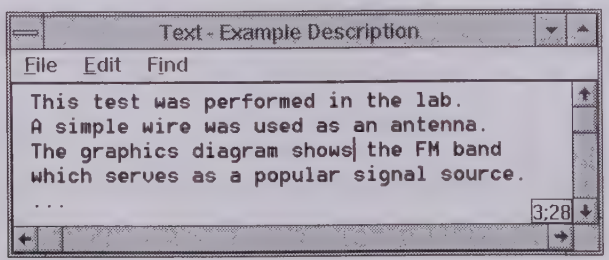
This editor can be used to generate or modify a test configuration (see 2.3).



The actual configuration is indicated in the "Selection" field, whereas the individual elements can be selected in the „Available" field.
The entries for the "selection" are performed by means of **Add**. Each element is determined in the selection windows "File Type" and "File Name" in the "Available" field. An element selected in the "Selection" field can be removed using the **Delete** key.

2.4.9 Text Editor

The text editor is quite similar to the Windows text editor "Notepad". Text can be inserted at the current cursor position. The position of the cursor (line ; column) is displayed in the right lower corner of the editor window. Edit -> Wrap toggles the automatic line wrapping. The typical clipboard functions are available in the same menu. The 'search' menu contains the function *Search...* and *Replace...* . *F3* repeats a search or replace downwards, *F4* upwards. *Goto...* enables to position the cursor into any line.

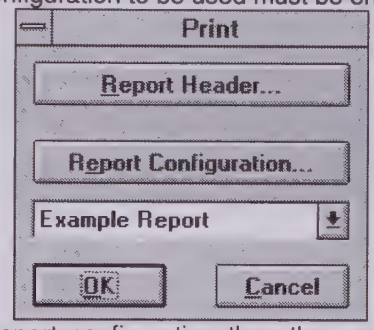

Text - Example Description
File Edit Find
This test was performed in the lab.
A simple wire was used as an antenna.
The graphics diagram shows the FM band
which serves as a popular signal source.
...
3;28

2.5 Report

Two printer drivers - designated as "printer" and "plotter" - can be installed for the test report.

2.5.1 Print...

This function is used to output a report on the printer selected in the menu **Printer Setup**. Before the output can be started, the report configuration to be used must be entered:



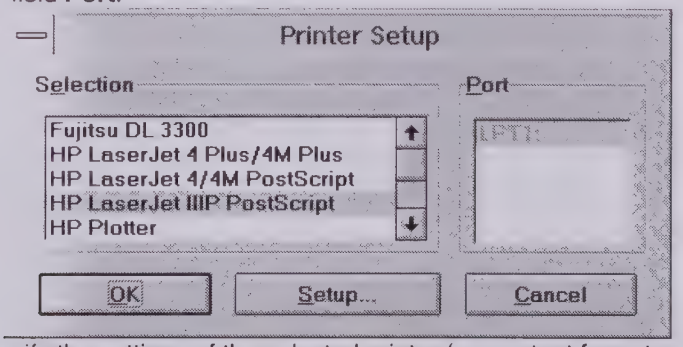
When starting a printout with a report configuration then the content as well as the report header selected inside can be edited (a shortcut for editing).

2.5.2 Plot...

This function is used to output a report on the plotter (printer) selected in the menu **Plotter Setup.** Before the output can be started, the report configuration to be used must be entered.

2.5.3 Printer Setup...

This function is used for selection of the printer device driver. The available device drivers are displayed under **Selection** The selection is made by *clicking* on the device driver name. The associated interface is output in the display field **Port**.



Setup... permits to specify the settings of the selected printer (e.g. output format, paper feed, etc.)

Notes:
In the event that the provided printer is not listed in the selection window, the respective device driver must be installed using the WINDOWS print manager (system control). A detailed description is to be found in the WINDOWS operating manual or can be optained by the WINDOWS online help.
A report can be output into a file in ASCII format. For this purpose, the device driver **Generic/Text only** must be provided together with the interface **FILE:**, installed as continuous printer without page makeup. During the output, an additional window for entering a DOS file name is opened. This ASCII file can be easily imported into other software applications.
If modifications are made in the printer installation of WINDOWS, they must also be made in the menu printer setup of ES-K1. The desired printer configuration is to be confirmed using the **OK** key.

2.5.4 Plotter Setup...

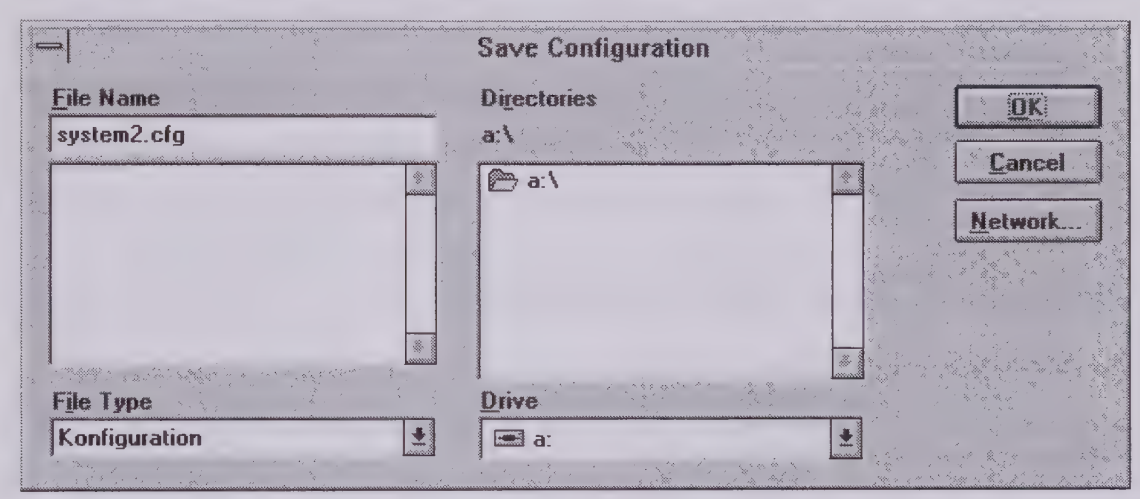
This function is used to select the plotter device driver. For the use of this function, refer to the printer setup.

Note:
It is possible to output a report as a file in the HPGL format. For this purpose, the printer driver **HP-Plotter** must be provided together with the interface **FILE:**, installed e.g. as Plotter 7550A with automatic paper feed in landscape format. For the output, an additional window for entering a DOS file name is opened. This HPGL file can be easily imported into other software applications, such as *Corel Draw*™ or *Ventura Publisher*™.
A provided IEEE-bus plotter can be operated via a data converter (e.g. GA234 - RS232/IEEE488 Converter of Greenwich Instruments Ltd.) on a serial interface (e.g. COM2:), however, not on the IEC bus, since this is not a standard interface for WINDOWS.
If modifications in the plotter installation of WINDOWS are performed, they must also be made in the menu Plotter Setup of ES-K1. The desired plotter configuration is to be confirmed using the **OK** key.

2.6 Special Functions

2.6.1 Configuration

The function **Save Configuration...** enables the user to save all files of the application that include configuration data (*.INI) in a given directory on floppy disk or hard disk (as copy).
Vice versa, **Load Configuration...** permits a software configuration to be restored. Thus, the configuration can also be used for another installation of the software.



2.6.2 Quit (*Alt-F4*)

Terminates the program ES-K1 and saves various general settings. If files have been modified but not saved yet, an additional prompt is displayed.

2.7 Options Menu

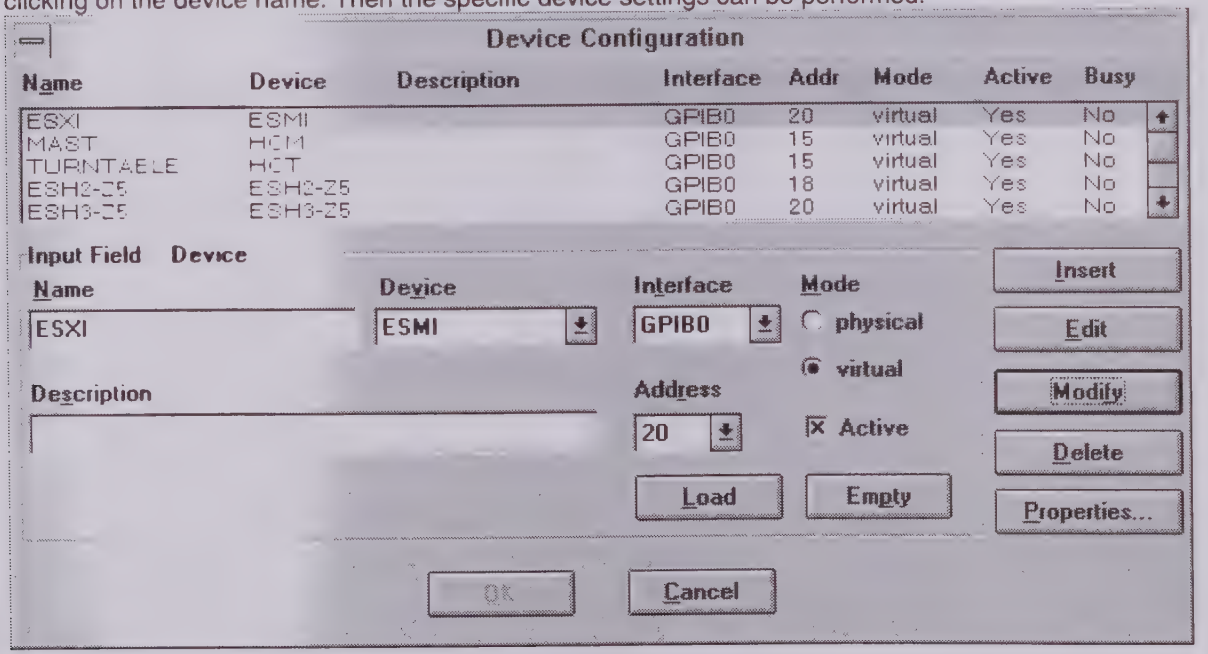
The menu **Options** is used for setting general parameters, e.g. device configuration and dialog language.
The menu consists of the following functions:

- Device Configuration
- Selftest
- Simulator
- Login
- User List
- Change Password
- Edit Accessory
- Configure Accessory
- Main Toolbar Visible
- Device Toolbar Visible
- Toolbar Strings Visible
- Status Bar Visible
- Background
- Change Language

The functions will be explained in detail on the following pages.

2.7.1 Device Configuration

The function Device Configuration enables the user to incorporate new devices in the software or modify the configuration for the provided devices.
The loaded device drivers are displayed in the upper selection window. They can be selected by double-clicking on the device name. Then the specific device settings can be performed.



All device functions can be executed in two different operating modes:

a) physical mode
The parameters are set on the device.

b) virtual mode
The settings are simulated by the software. The device is not addressed.

A (newly) installed device driver can be inserted by means of **Load**. After actuating the key, the respective device can be selected for editing in the selection window **Device**.

The device to be incorporated (designation of the device driver) is selected by means of **Device**; the function **Load** must already have been executed.

The **Name** is used to establish a reference to the software.

A short **description** - e.g. "Analyzer" - can be assigned to each device.

When the software is started, the communication via the specified **interface** is checked. The software settings must comply with the implemented hardware. The interface "GPIB0" (IEEE bus) is used as standard.

The **IEEE address** is important for the connected devices. For proper communication, the IEEE addresses in the device configuration must comply with the hardware settings on the device.

The **operating mode** determines whether the device is to be operated in **physical** or **virtual** mode.

All devices that are to be addressed or simulated via the software must be set to **active**. Before a device can be set to active, the respective device driver must be installed. The software recognizes an existing device driver, and *Yes* is displayed in the column *Active*. If the instrument is just being used, *Yes* is also entered in the column *Busy*.

Modify is used to transfer the modified settings to the device configuration.

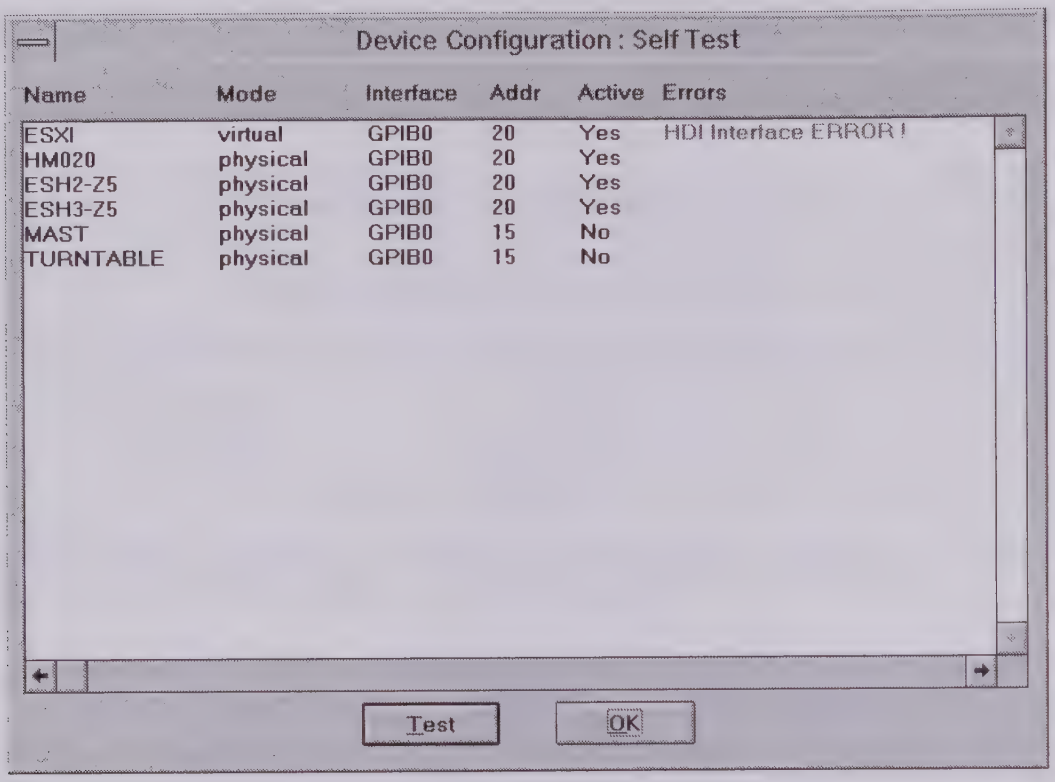
Insert transfers the settings to the device configuration (above the currently selected device) as a new device.

Delete is used to remove the selected device from the device configuration.

The definition of the device-specific **Properties** (see description of the respective device driver) must comply with the hardware of the device.

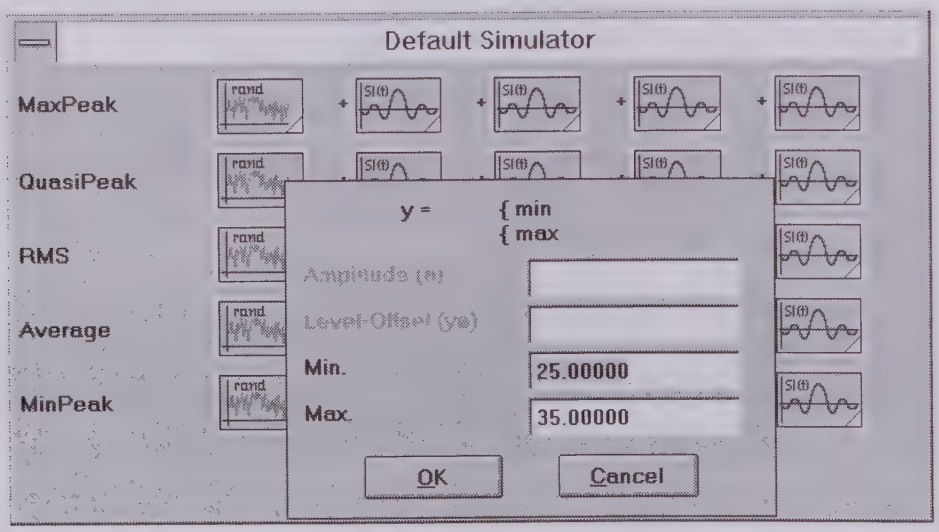
2.7.2 Selftest

The menu item **Selftest** repeats checking of the device list (according to the device configuration) as in the case of the software start. This is particularly useful if one or several devices were not yet in operation by mistake when the software was started: In this case, the software does not have to be restarted, and correction of the device configuration (for subsequently changing the devices not found from the virtual to the physical operating mode) is not necessary.


Device Configuration : Self Test
Name Mode Interface Addr Active Errors
ESXI virtual GPIB0 20 Yes HDI Interface ERROR !
HM020 physical GPIB0 20 Yes
ESH2-Z5 physical GPIB0 20 Yes
ESH3-Z5 physical GPIB0 20 Yes
MAST physical GPIB0 15 No
TURNTABLE physical GPIB0 15 No
Test
OK

2.7.3 Simulator

The function generator permits to simulate a scan or sweep with devices operated in virtual mode. A dialog window is opened for defining the settings (see below). A total of up to 5 basic functions can be superimposed (see below). The basic function is selected by clicking on the white triangle in the function symbol.



Sine function

$y(f) = y_0 + a * \sin(2\pi * (f - f_0) / F)$

Amplitude (a), level offset (y_0), period (F) and freq. offset (f_0) can be specified in a dialog window by clicking on the function symbol. The sine function can be used for simulation of broadband interference.

Si-Function (sin(x)/x)

$y(f) = y_0 + a * \sin(2\pi * (f - f_0) / F) / (2\pi * (f - f_0) / F)$

Amplitude (a), level offset (y_0), period (F) and freq. offset (f_0) can be specified in a dialog window by clicking on the function symbol. The Si-function can be used for simulation of narrowband interference.

Square function

$y(f) = y_0$ with $f < s$ and $f > e$

$y(f) = a + y_0$ with $s \leq f \leq e$

Amplitude (a), y-offset (y_0), start frequency (s) and stop frequency (e) can be specified in a dialog window by clicking on the function symbol. The square function can be used for simulation of broadband interference.

Random function

y(f) = [min ; max]

Minimum value (min) and maximum value (max) can be specified in a dialog window by clicking on the function symbol. The random function can be used for simulation of background noise.

2.7.4 Login, User List and Change Password

The Software ES-K1 is provided with password protection. This is of great importance for two reasons:

1. the data are protected against unauthorized access
2. the system configuration is only changed by authorized people

The program includes three user classes with different rights of access:

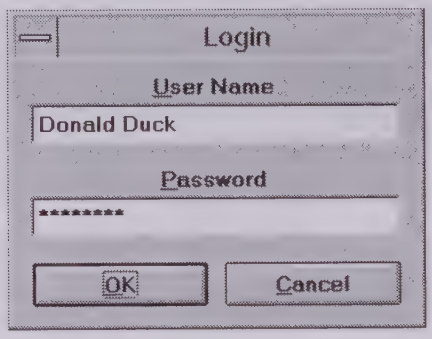
1. System manager
2. Extended
3. Standard

Besides, every user is assigned to a user group.

The rights of access are distributed as follows:

- The **system manager** has access to all components and data of the software.
- The **user with extended access rights** is assigned the same access rights as a system manager, with the following exceptions:
  - Processing of the device configuration
  - Processing of the path configuration
  - Processing of the user groups
  - Processing of the user list
  - Processing of the files outside his group (exception: files with the attribute **Public** may be processed)
- The **user with standard access rights** has the same access rights as a user with extended access rights, with the following exceptions:
  - Processing of the file type script
  - Reading of the files outside his group (exception: files with the attribute **Public** can be read)

When the software is started, the following dialog window appears:



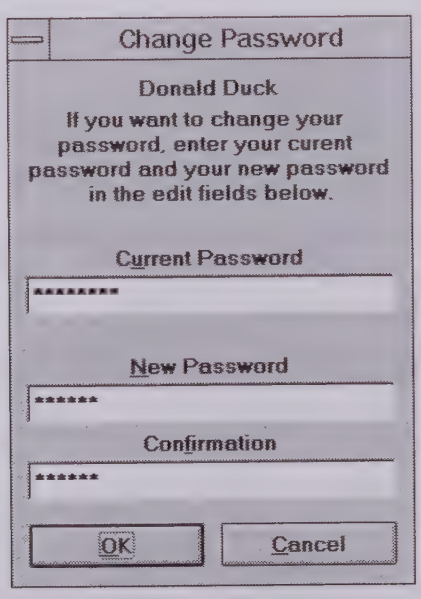
The user must enter his user name and password in this window. On pressing the **OK** key, the settings are checked and, in the case of a correct login, the main menu is entered.
The **Cancel** key is used to abort the start of the software and open Windows.

Option **Login**

This function is used to reregister a user in the software. The currently registered user is thus logged out automatically.
Besides, the same is true as for login on starting of the software.

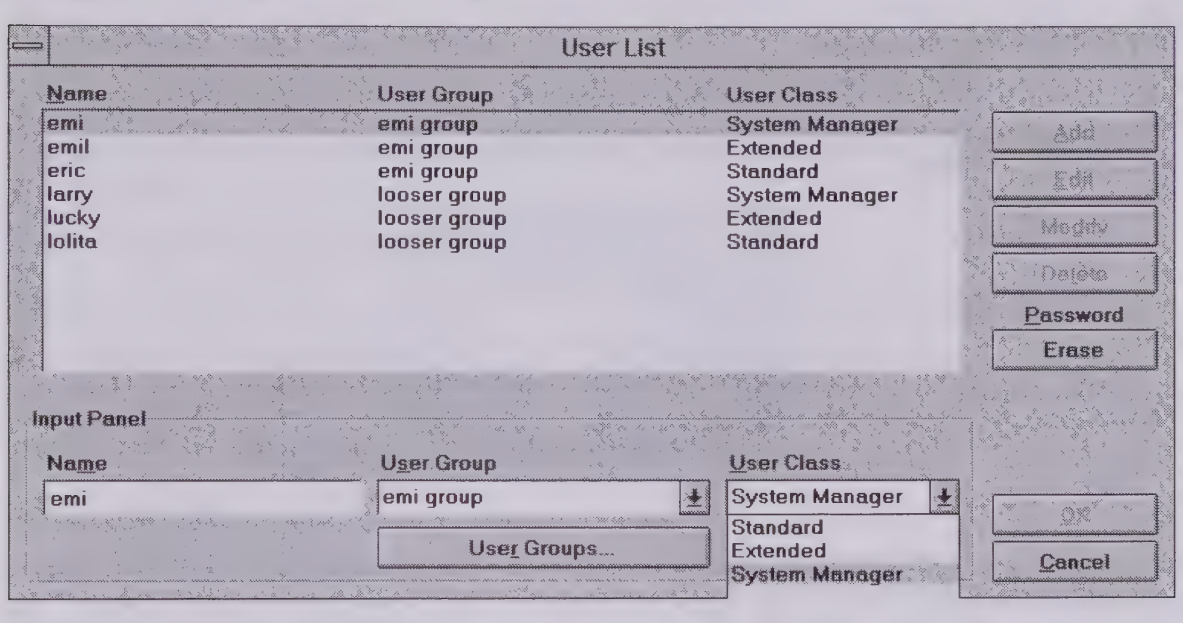
Option **Change Password**

To change the password, both the old and the new password must be entered (twice to avoid typing errors):

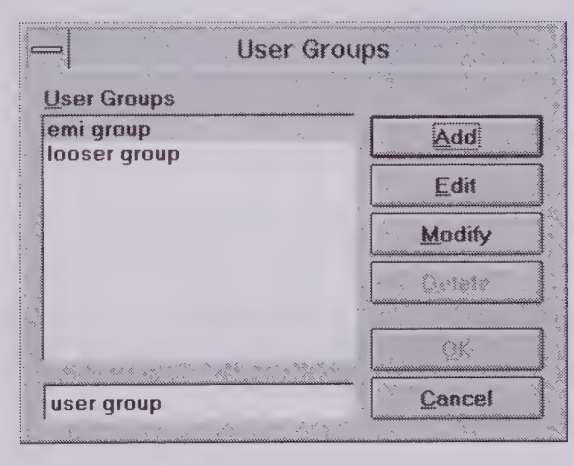


Option **User list**

In this dialog window, a user group and a user class are assigned to the user and made known to the system. The password can also be cancelled in this window, which permits the respective user to assign a new password without having to specify the old one:



For every user, an existing **user group** is to be selected and one of the three user classes allocated. The list of user groups can be edited via an extra dialog window:



2.7.5 Edit Accessory and Configure Accessory

see 2.8.4.2 Single Measurement

2.7.6 Main Toolbar, Device Toolbar and Status Bar

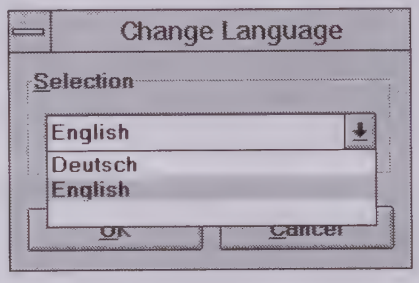
see 2.1 Overview

2.7.7 Background

see 2.1 Overview

2.7.8 Change Language

This function permits the user to change the language used in the dialog; at the moment, only English and German are offered.



2.8 Measurement Functions

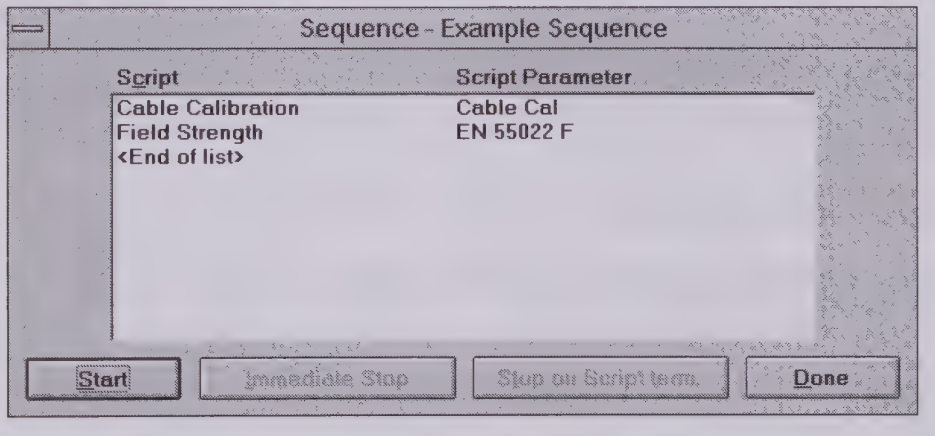
The menu **Test** is used e.g. for execution of the various measurement functions, for starting of scripts and for operation of the devices.

2.8.1 Interactive Device Dialog

Set Device permits to select a device entered in the device configuration for single operation. This function is identical with the selection of a device with the (activated) Device Toolbar. The dialog window of the respective device driver is opened and the settings can be made by the user in interactive mode. If an error occurs during the device access, the cause of the error must be determined by referring to the operating manual of the device involved. A detailed description of the dialog windows can be obtained from the respective description of the device driver.

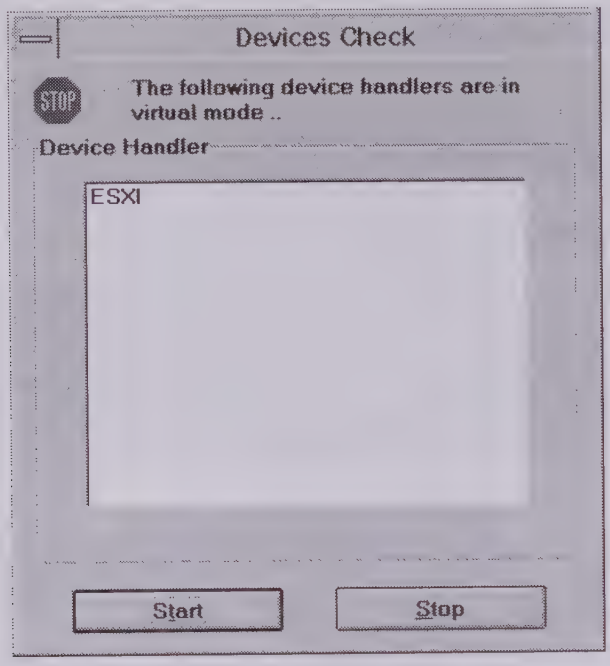
2.8.2 Sequence

Execute Sequence... offers a choice of the provided sequences. A selected sequence can then be started using **Start** and is continued until the end unless it is aborted before by pressing the keys **Immediate Stop** or **Stop on Script term.**.



2.8.3 Script

Execute Script... offers all provided scripts, however, only "main scripts" (MAINSCRIPT) can be started, whereas all other scripts are included in the main scripts (INCLUDE"...", SUBSCRIPT).
After confirming the selection by means of **OK,** the devices are checked. The devices that are in virtual mode are indicated in a window.



Subsequently, the dialog for the script parameter editor is displayed. It permits to select and edit the desired parameter set (see 2.4.2)
The script is executed using **OK** or **Cancel** (the last modifications on the parameter set are saved or ignored) or aborted using **Stop**. During the script run, the script can be interrupted and continued again or aborted for good.

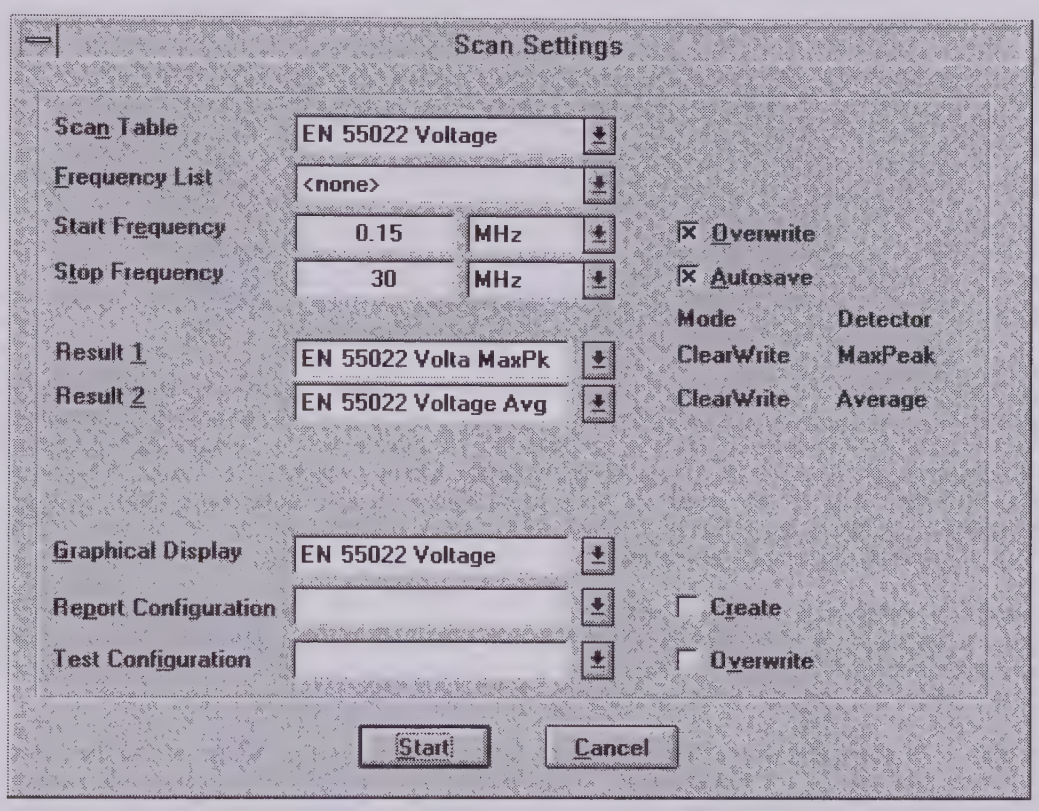
2.8.4 Measurement Functions

The submenu **Measurement** permits to select the EMI measurement functions. The following measurement functions are offered:

- Scan
- Sweep
- Single measurement

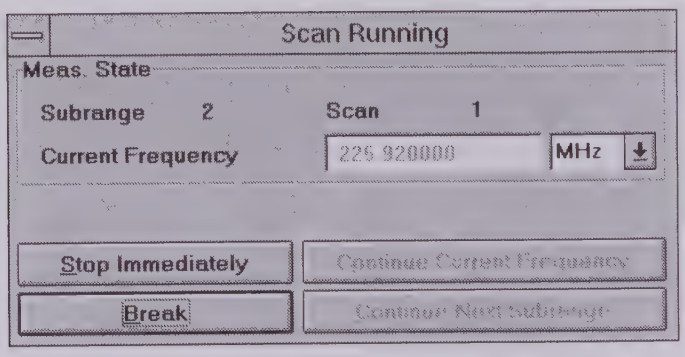
2.8.4.1 Scan and Sweep Functions with Automatically Generated Graphics

As soon as a table has been selected in the dialog for starting a scan or a sweep, the remaining fields are assigned names (derived from the table names) and the entire frequency range of the table is set. It is then possible to vary these entries at will, e.g. to define a limited frequency range or skip a suggested detector by deleting the result name. If the receiver is not capable of measuring in parallel with various detectors, the traces are recorded sequentially.



In the case of scans, it is additionally possible to select a **frequency list**. In this case, the measurement is not made with the step size specified in the scan table, but only at the frequencies of the frequency list that lie within the given frequency range.
If **Overwrite** is set, already existing measured values are completely deleted and overwritten. Otherwise, existing measured data are only overwritten or supplemented in the given frequency range.
If **Autosave** is set, the results are automatically saved. If the selection switch is not set, the data are lost unless they are displayed as a list or graphically.
Besides, the dialog permits to generate a **graphics configuration** for all data (traces) produced in the measurement run. For this purpose, a name for a configuration must be given for graphical display of the measurement results. If there is no graphics configuration under the given name yet, a new configuration with appropriate settings with respect to frequency range, level unit and traces is created. Otherwise, the existing graphic is only opened and the traces are entered; this however means that it might become necessary to adjust the diagram, thus making a currently measured curve visible.
When starting a scan or a sweep, then besides the graphics configuration the software also can create a default **test configuration** or a default **report configuration**.
The test configuration holds all referring files: The scan/sweep range table, the transducer and system transducers inside the range table, the graphics configuration, measurement results and the selected report configuration (incl. its report header if defined).
If *'Overwrite'* is selected then a new test configuration will be created. If not, then the entries will simply be added into an existing test configuration.
As a report configuration either an existing one can be selected which will simply be added to the test configuration, or a new one can be *created* which by default contains the following file entries: The scan/sweep range table, the graphics configuration and scan measurement results if those results were gained with a frequency list.

Once started, the progress of the scan or sweep can additionally be observed in a field at the current frequency; note that scan results are supplemented in blocks, whereas in the case of sweeps, only complete sweep subranges (according to the sweep table) are added.



A scan or sweep can be interrupted by the user and continued again. As soon as the scan or sweep has been aborted, it can be continued exactly at this position (frequency display), in the next subrange (if provided) or at a given frequency: For this purpose, the frequency display must be edited appropriately; depending on the set value, existing measurement results will be overwritten or there will be a gap in the measurement run. Thus, a test does not have to be repeated completely if a sudden change in the measurement conditions is detected immediately. The measurement run is simply aborted and continued at a lower frequency after correction of the measurement conditions.

If the stop frequency of a subrange and the start frequency of the next subrange are identical, this frequency is measured with the settings of the upper subrange. If both subranges are used, e.g. with different antennas (transducers), the stop frequency of the lower subrange should be slightly reduced (e.g. by one step size).

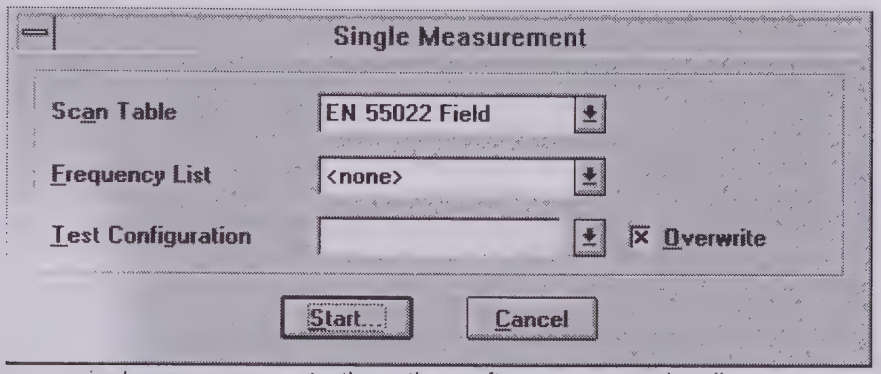
At the end of a scan or sweep, the frequency dependent transducer factor of the last range can optionally be programmed into the receiver - depending on the instrument's capabilities (if the number of correction values in the receiver is not sufficient then they will be interpolated). This way measurements can be done from the front panel of the instrument without any control from the software, but still with level readings that include a transducer correction. As long as the software controls the instrument, any transducer correction will be done in the software only which is much faster. The **transducer download** can be activated in the device properties dialogues of the receivers.

2.8.4.2 Single Measurement

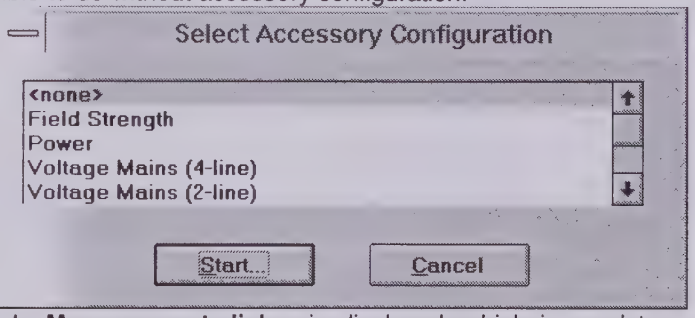
The dialog for interactive single measurements offers the following functions:

- a frequency variation is immediately set on the receiver with the next measurement
- the frequency variation by means of keys uses either the step size of the given scan table or the frequencies of a selected **frequency list**
- a measurement result is always produced or an existing measurement result varied or extended
- the measurement result can be extended by **predefined columns** which will be automatically filled with the **settings of accessories** (polarisation, artificial mains network lines, etc.) at the time of the measurement
- the frequency display can be coupled to a **marker** located on a trace for display of the measurement result

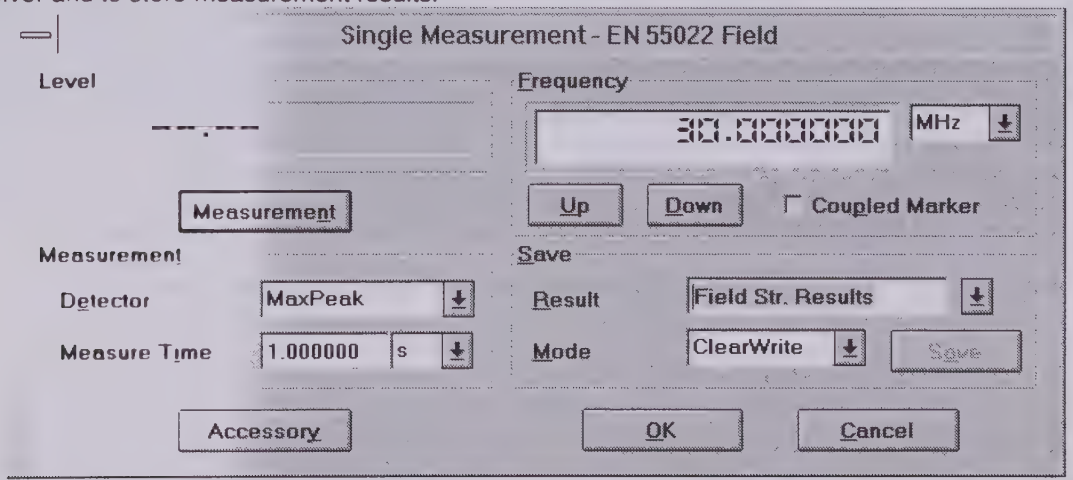
When a single measurement is started, the **Scan Table** to be used and an optional **Frequency List** are to be selected:



When starting a single measurement, then the software can optionally create a default **Test Configuration** which holds all referring files (scan/sweep table, transducer, system transducers, measurement result file).
If *'Overwrite'* is selected then a new test configuration will be created. If not, then the entries will simply be added into an existing test configuration.
Subsequently, a choice of the **Accessory Configuration** is offered (determines the column layout of the produced measurement result and the accessory to be connected; for editing of the configuration see below). It is also possible to do without accessory configuration:



Then the actual **Single Measurement dialog** is displayed, which is used to control the respective receiver and to store measurement results:



The frequency may vary throughout the entire frequency range of the associated scan table. Besides, the detector and the measuring time can be varied; all other test parameters result from the settings of the scan table.

The value for the measurement time can be defined at will; however, depending on the receiver used, the next higher possible measuring time may be set on the instrument.

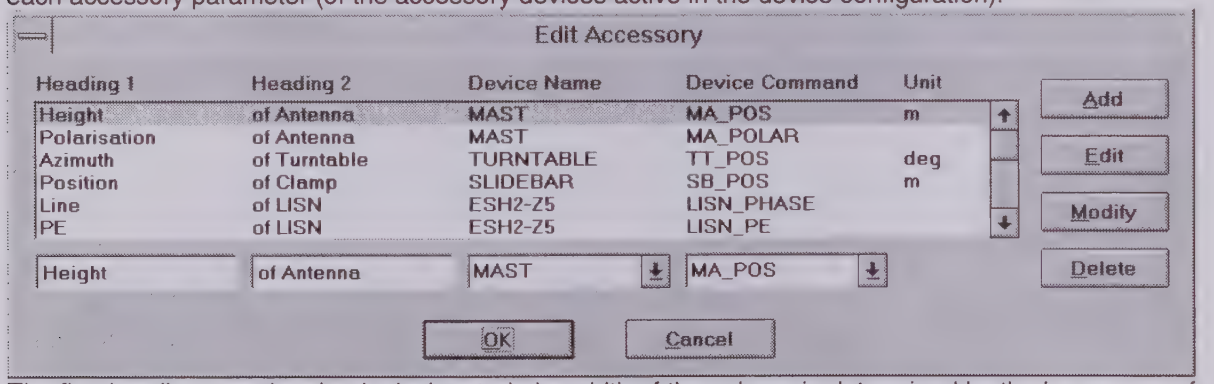
Using the key **Measurement**, the first measurement run is started and repeated continuously. Each frequency variation causes a corresponding change on the receiver (a variation of detector or measuring time is transferred by means of **Measurement** or a further frequency variation).

Save is used to insert the current measured value in the measurement result or vary it together with accessory settings if selected and if the associated device dialogs have been started before (see below).

The frequency display can be coupled to the marker of a diagram. For this purpose, the **Coupled Marker** function must be activated in the dialog window on the one hand and an appropriate device configuration opened on the other hand, in which the specified measurement result is indicated and on the trace of which the marker is located. For already existing test points, the marker frequency and the test frequency shown in the single measurement dialog correspond to each other, i.e. shifting of the marker also causes a frequency variation in the receiver.

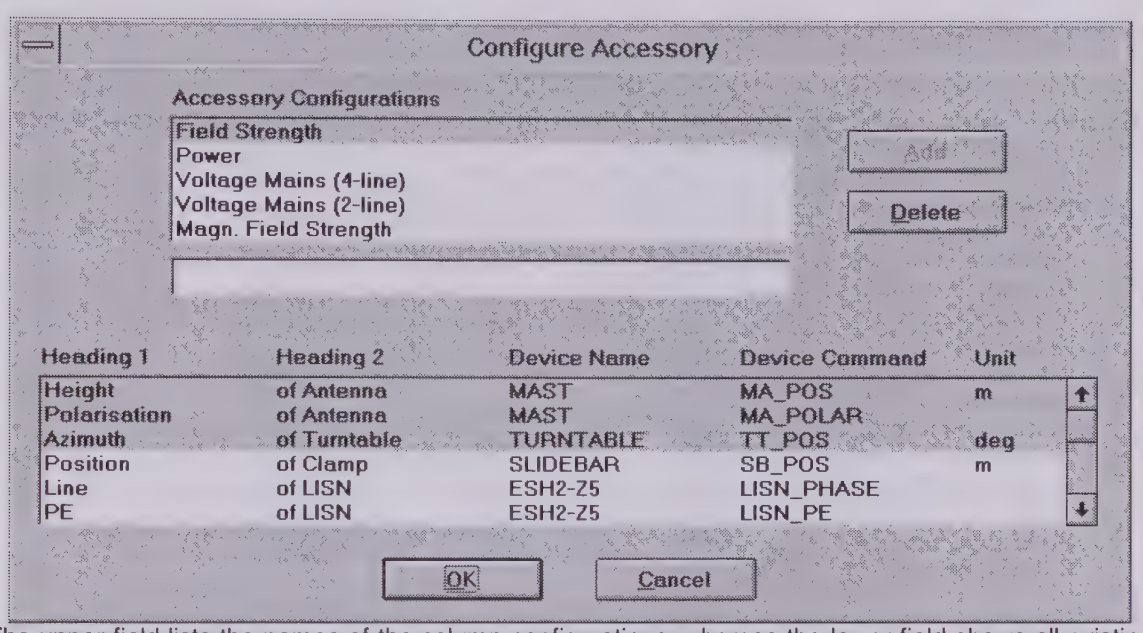
If a frequency list has been selected with the scan table, the **Up/Down** keys only permit to set the frequencies of the list lying inside the frequency range of the scan table; of course, additional intermediate values can be set by editing the frequency display, and the measurement result can be extended accordingly.

Columns can automatically be added to the measurement result, in which the current settings of accessory devices are stored for each measurement. If a single measurement result is stored, the associated accessory settings are automatically entered in the respective fields (i.e. next to frequency and level, e.g. the turntable angle). To this end, the columns must be defined accordingly, i.e. the columns must be assigned to the accessory (e.g. an automatic antenna mast) and the associated parameter (e.g. polarisation). For this purpose, two dialogs are provided, the first one allowing to edit the setup of all columns, the second one to produce a combination of these columns.
The menu item **Edit Accessory** (options) is used to open a dialog which permits to define a column for each accessory parameter (of the accessory devices active in the device configuration):



The first heading must be clearly designated; the width of the column is determined by the longer one of the two headings (max. 15 characters). When a (symbolic) device name has been selected, the associated device command (query for a particular setting) must also be selected. Such a column definition can then be appended to the existing list and also modified or deleted subsequently.

The second dialog is started by means of the menu item **Configure Accessory** (options):



The upper field lists the names of the column configurations, whereas the lower field shows all existing column definitions (produced with the dialog **Edit Accessory**). When a name has been selected in the upper field, the associated columns are marked in the lower field; this marking can be changed at will (best to be done using the mouse key with simultaneously pressed Ctrl key) and any combinations can be formed, which become valid immediately when the dialog is terminated with OK.
The edit field in the middle permits to generate new column configurations, which can be edited immediately or subsequenty by means of a marking in the lower field.

To make a column configuration effective the following steps are needed:
First the device dialogs have to be started (they might be iconized).
Then the single measurement dialog has to be started, which requires to select a scan table (plus optionally a frequency list and a test configuration, see above) and a column configuration.
Now a measurement can be started.
The name of the measurement result file has to be entered or selected.
When the **Save** key is pressed for the first time the columns will be added to the file and the result along with the device positions will be stored.

2.9 Evaluation Functions

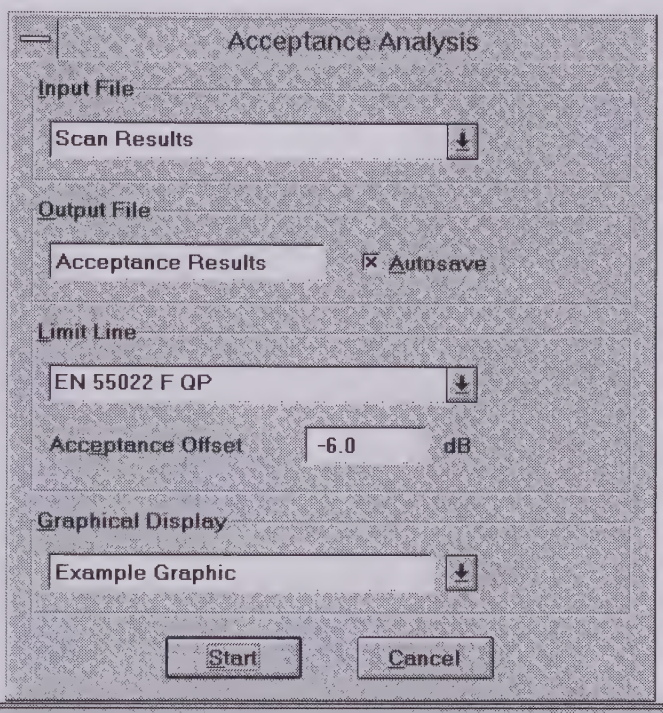
The menu **Test** is used e.g. for execution of the various analyzing functions. The submenu **Evaluation** includes the following functions:

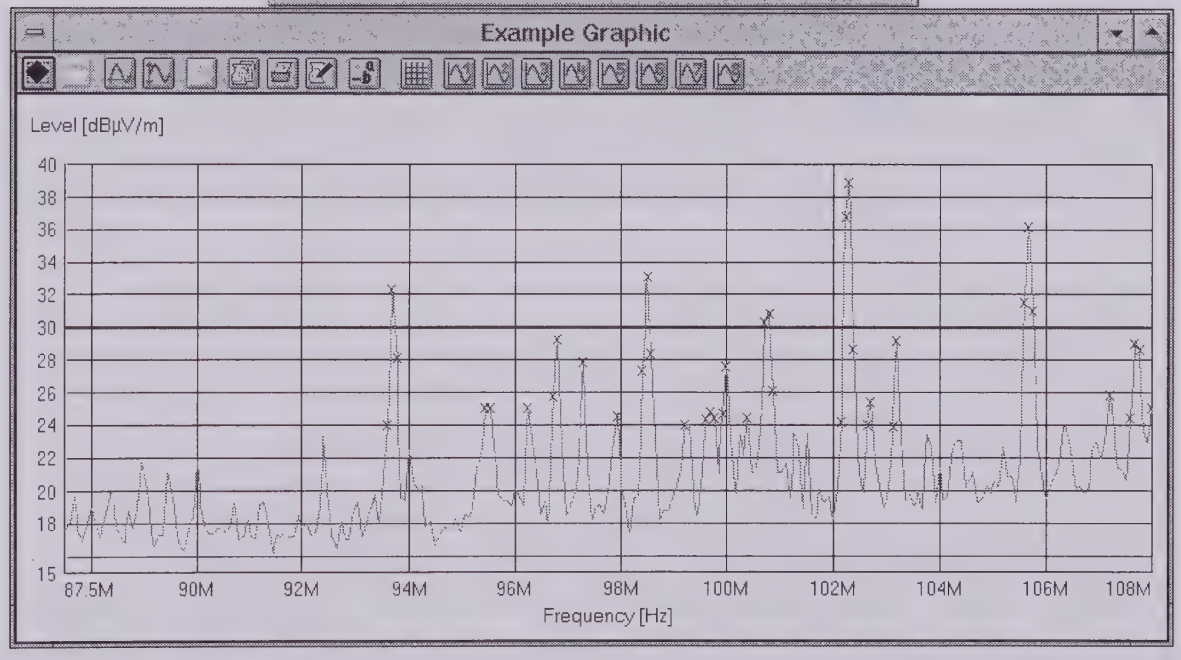
Acceptance Analysis
Peak Reduction
Subrange Maxima Reduction
Subrange Minima Reduction
Maxima Reduction
Octave Maxima Reduction
NB / BB Discrimination
Conversion to ... / MHz
Unit Conversion
Merge Data
Exclude Ambients
Weighted Addition
Reduce to Freq.List
GTEM Correlation

Most evaluation functions permit to generate a **Graphics Configuration** including all data relevant to the evaluation (e.g. input/output files, limit line). To this end, a name for a configuration for graphical display of the data must be specified. If there is no existing graphics configuration under the specified name yet, a new configuration with appropriate settings of frequency range, level unit, traces, etc. is created (if an evaluation function uses two different level units at the same time, two graphics configurations are created accordingly); otherwise, the existing graphics is only opened.
The duration of the evaluation functions is usually a few seconds; however, it may be longer if large input files are involved and if they are to be displayed graphically at the same time. The GTEM Correlation requires very time-consuming calculations so that the size of the input file makes itself felt clearly.
Evaluation functions with a specified limit line ignore all test points of the input file for which the limit value is no longer defined.

2.9.1 Acceptance Analysis

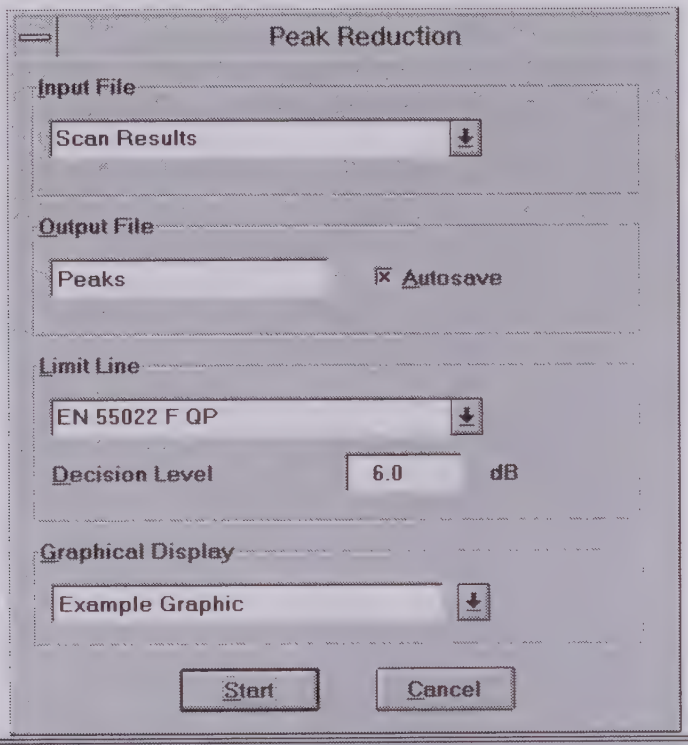
The acceptance analysis is used to filter off signals which are further off a specified limit line. This includes in particular the background noise of the receiver. The acceptance analysis is implemented by means of an imaginary acceptance line which cuts off all measured values falling below it. The acceptance line runs parallel to a limit line with a specified offset (e.g. an offset of -10 dB means 10 dB below the limit line).
If the offset is very large (e.g. 200 dB), all signals are cut off, if it is very small (e.g. -200 dB), they are all maintained.

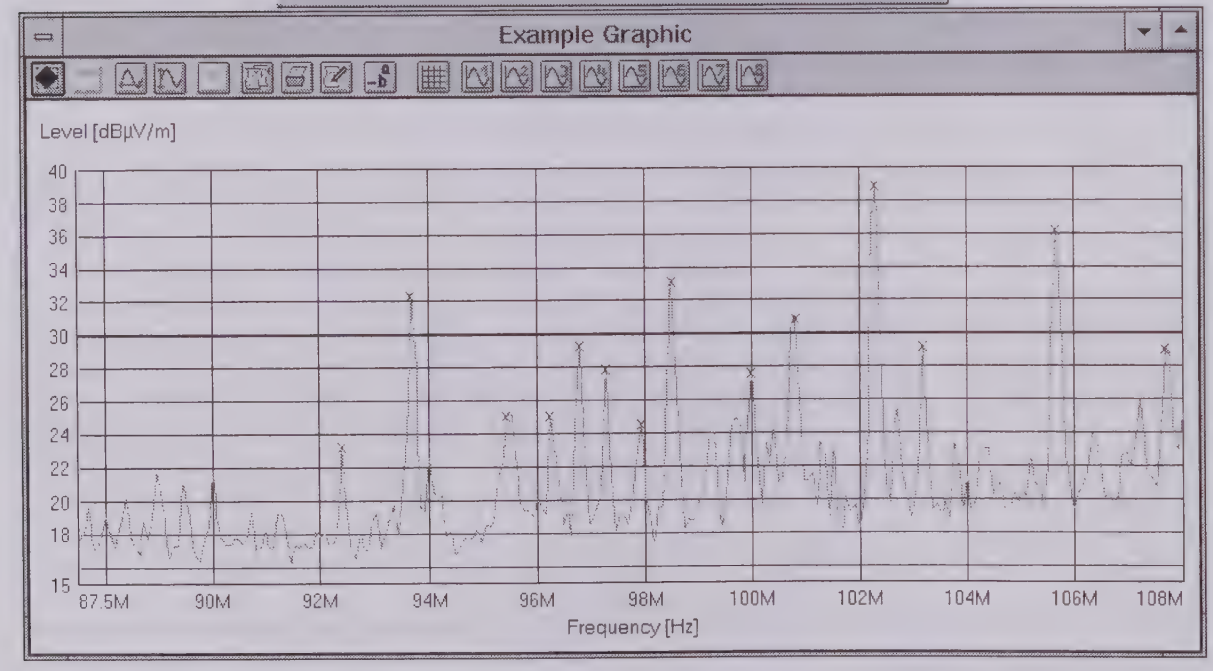




2.9.2 Peak Reduction

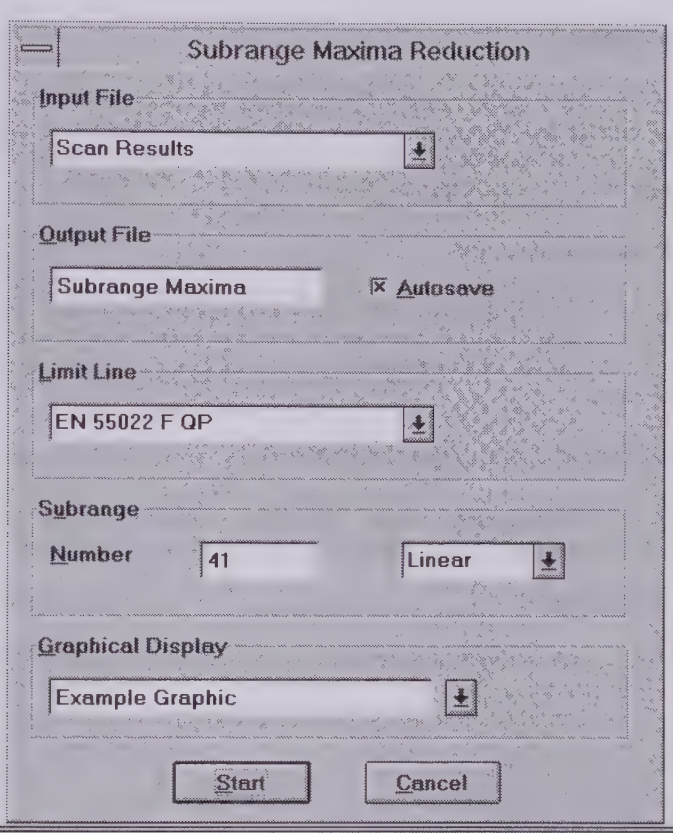
This function is used to determine all "Peaks" (preferably narrowband interference) depending on a user-defined decision level. For this purpose, the trace is analyzed by means of a special algorithm. The decision level determines how far a local maximum must exceed the adjacent lower test points to be considered as a "Peak" and appear in the output file (see flowchart on next page).
If a limit line is also specified, not the absolute level characteristic of the trace is examined, but the distance between the test point and the respective limit value.
With a decision level of 0 dB, all local maxima are detected as "Peaks", wereas, with a value of e.g. 20 dB, only distinctive narrowband signals are detected.

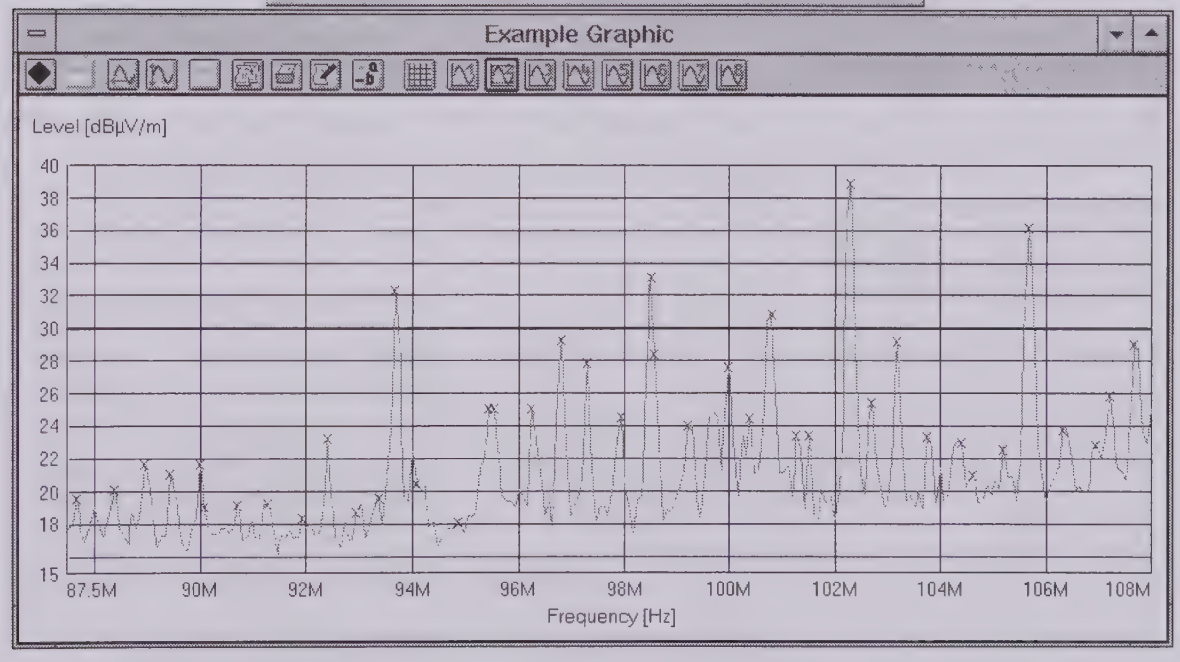




2.9.3 Subrange Maxima Reduction

This function is used to split the trace of the input file into a given number (max. 1000) of subranges. The maximum is determined for each subrange and transferred to the output file. If a limit line is also specified, not the absolute level characteristic of the trace is examined, but the distance between the test points and the respective limit value. The limits of the subrange are equidistant for linear or logarithmic scales.
The function is suitable for detecting broadband signals in addition to narrowband signals over the complete measured spectrum.





2.9.4 Subrange Minima Reduction

This function is used to determine the subrange minima of a measurement result. It is used for example in open-area measurements: It permits to identify frequency points which are little or not at all occupied by external signals. Such frequencies are best suited for measuring antennas or similar.
The handling of the parameters for subrange minima reduction is similar to that of the subrange maxima reduction (see 2.9.3).

2.9.5 Maxima Reduction

This function is used to transfer a given number (max. 1000) of maximum levels of the input file into the output file. If a limit line is also specified, not the absolute level characteristic of the trace is examined, but the distance between the test points and the respective limit value. Thus it is possible to focus e.g. on the 10 most critical points of a measurement result.

2.9.6 Octave Maxima Reduction

This function is used to split the trace of the input file into frequency octaves. For each octave, a given number of level maxima is determined and transferred into the output file. If a limit line is also specified, not the absolute level characteristic of the trace is examined, but the distance between the test points and the respective limit value.

2.9.7 Narrowband/Broadband Discrimination

This function is used to discriminate between narrowband (NB) and broadband interference (BB). Four methods are provided, the tuning methods analysing only the shape of the trace:

Peak/Average value comparison:

Two data lists are available, one being measured with the PEAK detector, the other with the AVERAGE detector.

Narrowband interference:
(PEAK - AVERAGE) ≤ decision level.
Potential broadband interference:
(PEAK - AVERAGE) > decision level.

Peak/RMS value comparison:

Two data lists are available, one being measured with the PEAK detector, the other with the RMS detector (root mean square).

Narrowband interference:
(PEAK - RMS) ≤ decision level.
Potential broadband interference:
(PEAK - RMS) > decision level.

Tuning methods

a) Tuning by +/- one bandwidth:

A data list is available that was measured with a scan step size of
0.45 ... 0.55 * IF bandwidth.
The decision range lies between reference level and the decision level (e.g. 3 dB below). A total of 2 adjacent levels are investigated.
Narrowband interference:
The 2nd adjacent levels lie below the decision range and the 1st adjacent levels lies below the reference level.
Potential broadband interference:
The point has not been identified as being a narrowband signal.

Note:
Those points at the edge of a scan range will also be analysed, with the "missing" point assumed as fulfilling the condition for narrowband interference.
Only potential **broadband interference** that is not located close to (+/- one IF bandwidth) narrowband interference is actually determined as broadband interference.

b) Tuning by +/- two bandwidths:

A data list is available which was measured with a scan step size of
0.60 ... 0.75 * IF bandwidth (0.45 ... 0.60 * IF bandwidth).
The decision range lies between reference level and the decision level (e.g. 3 dB below). A total of three (four) adjacent levels are investigated.
Narrowband interference:
The 3rd (4th) adjacent levels lies below the decision range and the remaining two (three) adjacent levels lie below the reference level.
Potential broadband interference:
The point has not been identified as being a narrowband signal.

Note:
Those points at the edge of a scan range will also be analysed, with the "missing" point(s) assumed as fulfilling the condition for narrowband interference.
Only potential **broadband interference** that is not located close to (+/- two IF bandwidths) narrowband interference is actually determined as broadband interference.

2.9.8 Conversion to ... / MHz

This function is used to add a broadband factor to a level as is required in particular specifications for the description of broadband interference.

The level unit is changed to "level unit per MHz" (for military specifications in the USA). The IF bandwidth depends on the scan or sweep table and the frequency at which the level has been measured. The broadband factor is: -20 * log(IF bandwidth / 1 MHz).

As a further "conversion" (numerical values remain unchanged), the unit can be changed to "level unit per bandwidth" (for military specifications in France).

The following conversions are possible:

Level unit before conversion	Level unit after conversion with .../MHz	Level unit after conversion with .../BW
"dBµV"	"dBµV/MHz"	"dBµV/BW"
"dBµV/m"	"dBµV/m/MHz"	"dBµV/m.BW"
"dBµA"	"dBµA/MHz"	"dBµA/BW"
"dBµA/m"	"dBµA/m/MHz"	"dBµA/m.BW"

2.9.9 Unit Conversion

This function is used for unit conversion. The following conversions are possible (R: characteristic impedance, e.g. R = 50 ohms):

Unit	Unit after conversion
dBµV	y dBµA = x dBµV - 20 log(R)
	y dBpW = x dBµV - 10 log(R)
	y dBm = x dBµV - 10 log(R) - 90
dBµV/MHz	y dBµA/MHz = x dBµV/MHz - 20 log(R)
dBµV/m	y dBµA/m = x dBµV/m - 20 log(R)
dBµV/m/MHz	y dBµA/m/MHz = x dBµV/m/MHz - 20 log(R)
dBµA	y dBµV = x dBµA + 20 log(R)
	y dBpW = x dBµA + 10 log(R)
	y dBm = x dBµA + 10 log(R) - 90
dBµA/MHz	y dBµV/MHz = x dBµA/MHz + 20 log(R)
dBµA/m	y dBµV/m = x dBµA/m + 20 log(R)
dBµA/m/MHz	y dBµV/m/MHz = x dBµA/m/MHz + 20 log(R)
dBm	y dBpW = x dBm + 90
	y dBµA = x dBm + 90 - 10 log(R)
	y dBµV = x dBm + 90 + 10 log(R)
dBpW	y dBm = x dBpW - 90
	y dBµA = x dBpW - 10 log(R)
	y dBµV = x dBpW + 10 log(R)
dBpT	--

2.9.10 Merge Data

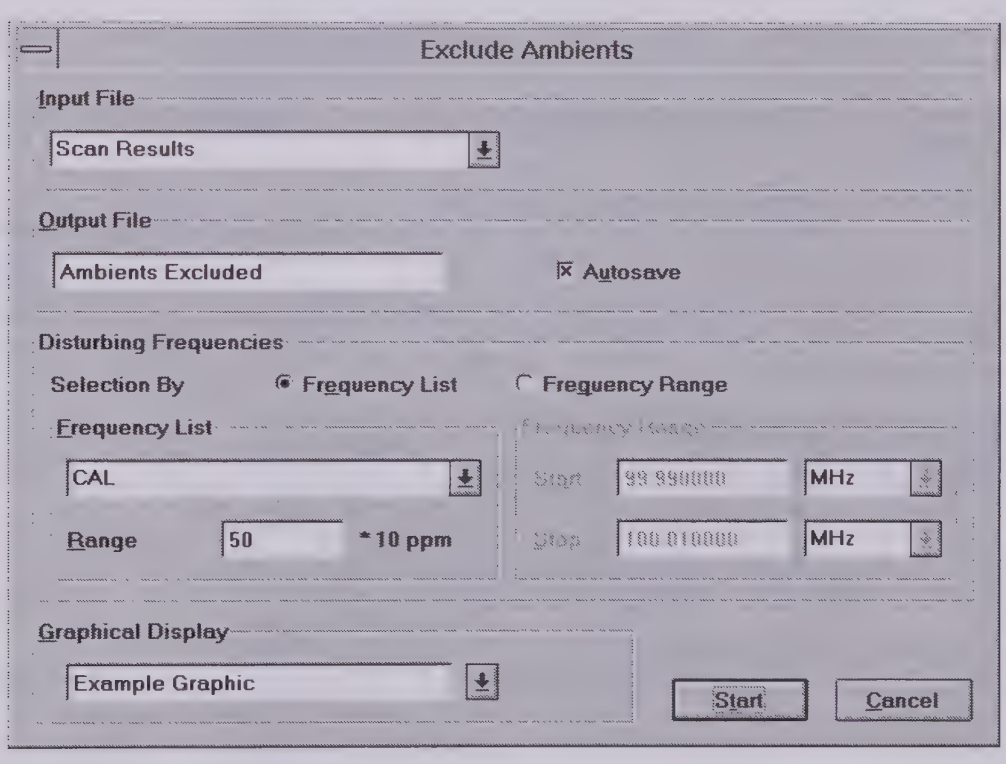
This function is used to merge all values of two measurement result lists. If the frequencies are the same, the complete line will be entered into the data list with the maximum level (Maxhold). If the frequencies are not the same, both lines will be entered into the data list. The columns in the two data lists must comply with each other.

2.9.11 Exclude Ambients

This function is used for removing ambients from a measurement result.

Two methods can be selected:

1. All entries of the **frequency range** between a start and a stop frequency are removed.
2. Small ranges are removed according to a frequency list. A delta range about the frequencies must be entered with a **factor**:
   Delta range = Frequency * **Factor** * 10 ppm (10 millionth)
   z.B. Frequency= 100 MHz, Factor = 50
   Delta range = 100 MHz * 50 * 10e-6 = 50 kHz , i.e. ± 25 kHz about 100 MHz



2.9.12 Weighted Addition

The **weighted addition** permits to treat two data sets in **correlated** (addition of the voltages), **uncorrelated** (addition of the powers) or even **direct** mode (addition of the levels). In the **direct** mode, even negative factors can be easily used, i.e. even any subtractions can be implemented, since the values are not logarithmized:

direct: $dest = a * source1 + b * source2$

correlated: $dest = 20 \log [a * 10^{source1/20} + b * 10^{source2/20}]$

uncorrelated: $dest = 10 \log [a * 10^{source1/10} + b * 10^{source2/10}]$

a, b: Factors (weighting) of the data sets.

2.9.13 Reduce to Frequency List

Using the evaluation function **Reduce to Frequ.List,** a frequency list can be generated from a measurement result: As input file, an existing measurement result file is selected and, by means of the evaluation function, an output file of the type frequency list is generated with the specified name. Figuratively speaking, only the first column of the measurement result, i.e. the one with the frequency, is transferred. Such a file may e.g. serve the purpose of running a scan only at the frequencies of this frequency list.

2.9.14 GTEM Correlation

This function is used for converting emitted EMI that has been measured by an EUT in a GTEM cell (Gigahertz Transverse Electromagnetic). This function permits to compare the data with the measured electrical field of an open-area test site (OATS).

The correlation algorithm is based on the following model:

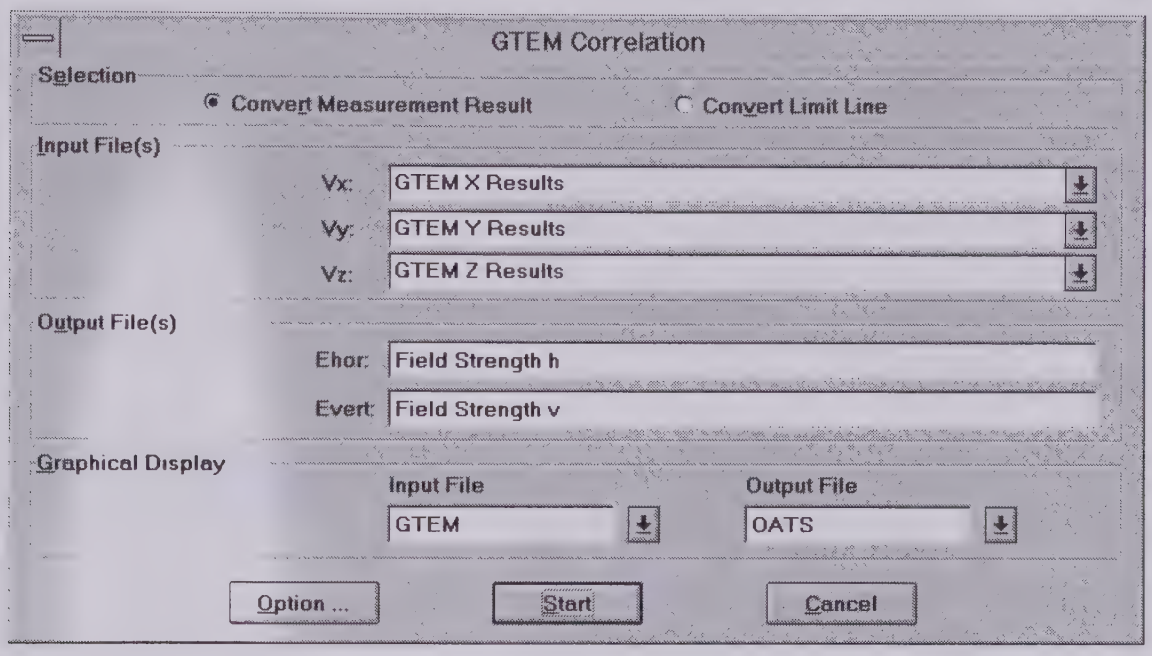
a) The test item is measued in the directions x, y and z in the GTEM cell. The respective results are referred to as V_x, V_y and V_z.

b) Based on V_x, V_y and V_z the interfering power of the test item is calculated depending on the GTEM dimensions.

c) The calculated interfering power is simulated as follows:
The test item is replaced by a dipole which is aligned according to the polarization of the test antenna and corresponds to the calculated interfering power. The corresponding electrical fieldstrength is calculated at the position of the antenna. In the case of an anechoic chamber with metal floor, the maximum fieldstrength of the various antenna heights is the corresponding electrical fieldstrength.

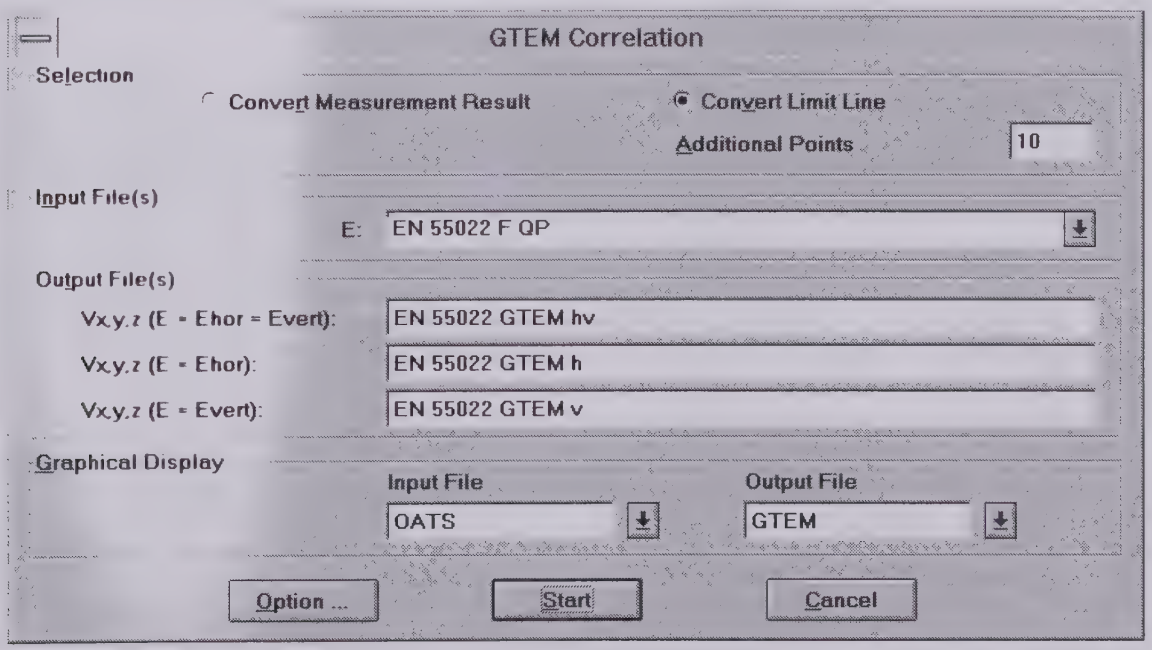
Two methods can be selected:

a) Measurement result conversion
The interfering voltages V_x, V_y and V_z are measured. The fieldstrength characteristic is obtained by means of correlation and can be directly compared with the respective fieldstrength limit line.



The input file(s) correspond to the interfering voltages of the test item measured in three orthogonal directions. At least one input file must be specified. The scan or sweep tables of the input file(s) must be identical. Input file(s) that are not entered are set to zero.
The output file(s) correspond to the fieldstrengths for horizontal and vertical polarization. At least one output file must be specified. Output file(s) that are not entered are not calculated.

b) Conversion of Limit Lines
In contrast to the first method, the fieldstrength limit line is first converted into a voltage limit line $V_{x,y,z} = (V_x^2 + V_y^2 + V_z^2)^{1/2}$. The advantage of this method is that the resulting interfering voltage from V_x, V_y and V_z can be directly compared with the calculated limit line.



Additional values determines the number of the additional sampling points for calculation of the limit line. Since the number of sampling points is usually very small and the conversion results in a more complex trace, it is advisable to use more sampling points - e.g. 100. The calculation is performed in two steps:

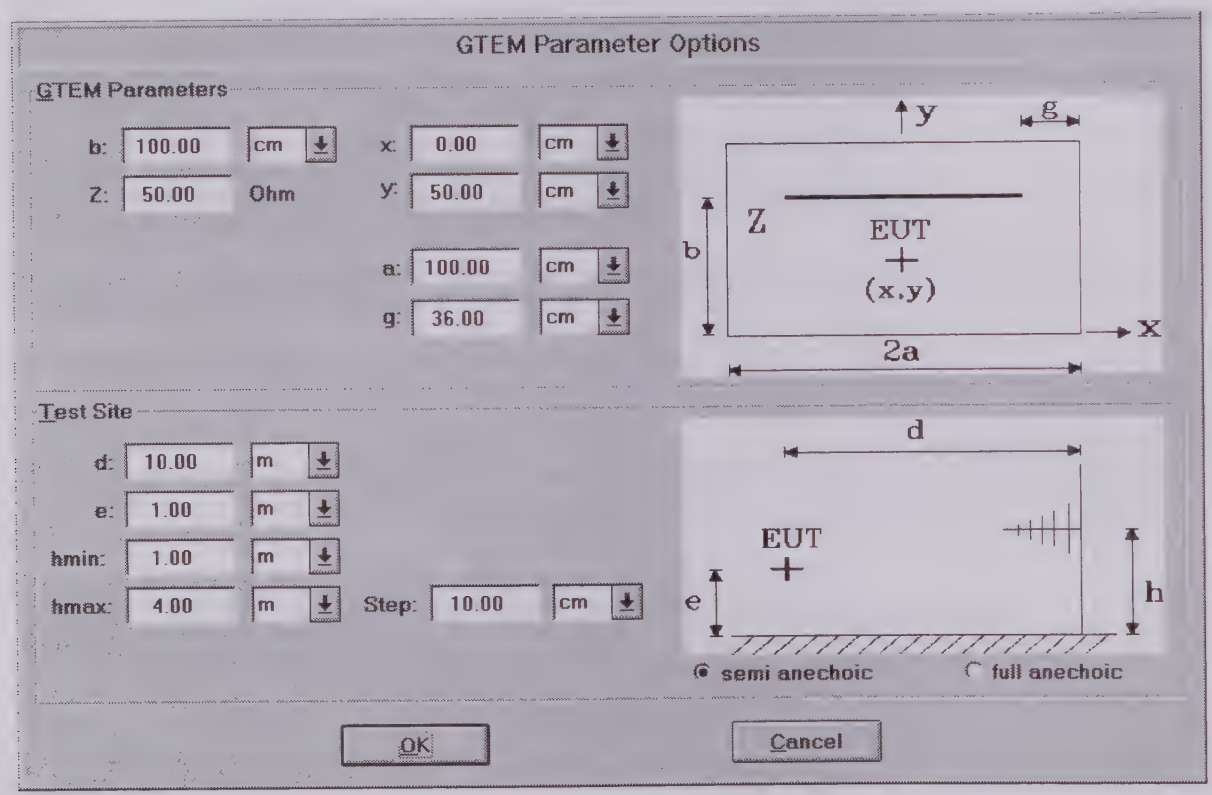
First of all, each point of the entered limit line (frequency / level) is converted.

In addition to the provided points, the entire frequency range is divided into the specified number of sampling points, linearly or logarithmically (according to the intermodulation mode of the limit line).

Each of these sampling points (frequency / interpolated level) is then converted.

The output file(s) correspond to the respective voltage limit lines of the entered fieldstrength limit line of the standard used. A distinction is made between limit lines for horizontal, vertical and horizontal+vertical polarization. Output file(s) that are not specified are not calculated.

The key **Start** checks the settings and the correlation is started. When selecting the key **Option ...** an additional dialog window for entering the parameters for the GTEM dimensions and the reference open-area test site is opened.



The fields **GTEM Parameters** permit to set the dimensions of the GTEM cell. The geometry of a GTEM cell is defined by $a = b$ and $g = 0.36 * a$. The values x and y indicate the middle of the test item. These values are normally $x = 0.0$ and $y = 0.5 * b$. When changing the value b, the values for a, g and y are automatically adapted. The value Z indicates the impedance of the GTEM cell, the standard value for Z is 50 ohms.

The fields **Test Site** determine the dimensions of the reference open-area test site.

With **semi anechoic** selected, the measurement is simulated for a test site with conductive ground plane. In this case, the maximum level is calculated between minimum antenna height *hmin* and maximum antenna height *hmax*.

With **full anechoic** selected, on the other hand, the measurement is simulated for a test site with absorbing ground plane. In this case, the level is calculated for one antenna height only.

3 Standard Scripts

The standard scripts are designed for a maximum flexibility thus enabling to perform the tests most effectively with all kinds of test equipment.

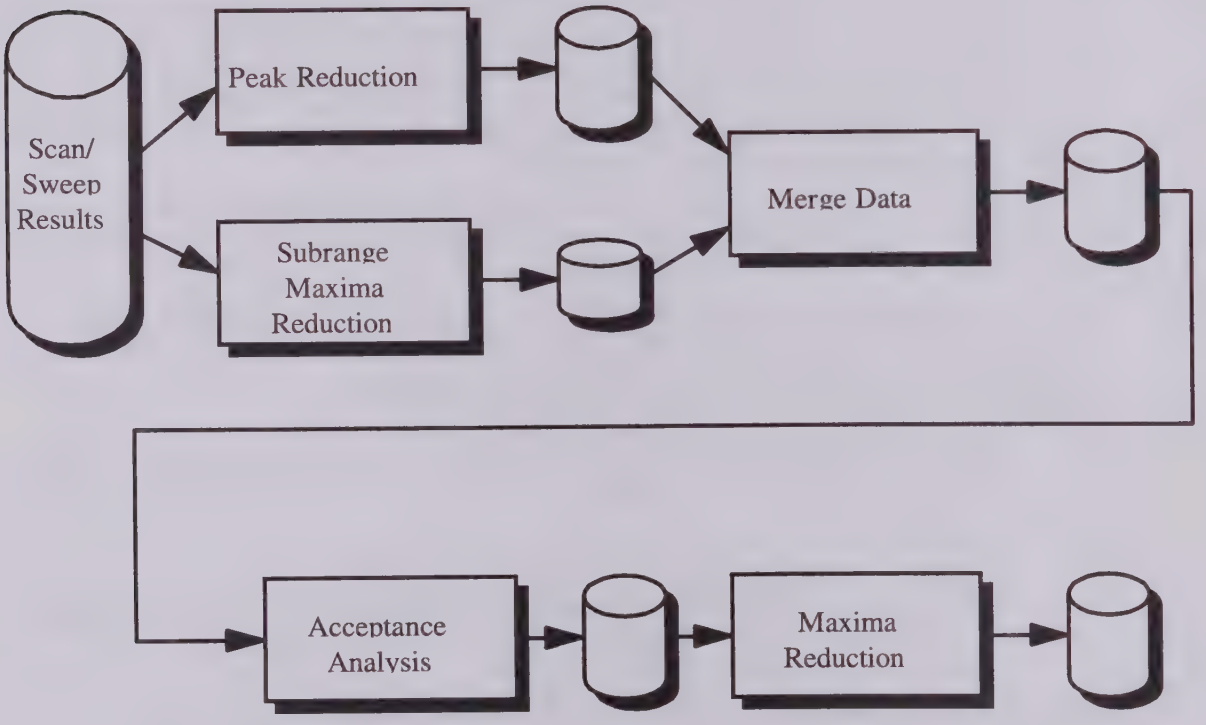
The design of the scripts helps to save time while still providing complete measurements as required for compliance testing. Through a wide range of parameters (accessible after starting a test) that can be stored and reloaded as "Script Parameters", it is possible to adapt and optimise the test proceedings to the needs of the operator:

- when a test has been completed, the **results can be partially overwritten through remeasuring** in a second test, defining a frequency band only
- the preview test can be skipped and instead a **former preview result** can be defined as an input of the data reduction and the final test; alternatively, **frequency lists** or **former final results** can be used as an input of a final test
- in a **semi automatic mode** the operator can skip certain parts of the test (preview test, final test, test report) or repeat the same test, then optionally leaving out other parts than during the first pass
- the total frequency range of the test can be split into **subranges** (linear or logarithmic, with respect to the ranges of the range table) that will be completely tested (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency, and increasing the frequency resolution with sweeps; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in the field strength test: one single antenna change during the whole test)
- an **ID string** makes it easy to identify results and other files related to the test: the string will be used to build up default filenames (e.g. if test reports shall always include the same report header), but it is also possible to define fixed names
- since the variation of accessory devices (LISN, automatic turntable and antenna mast, etc.) can be specified for preview and final test separately, it is possible to **optimise the test to the test equipment** (the kind of test also influences the optimum concept):
  EMI analyser (**fast sweeps** with limited frequency resolution):
  - preview test with sweeps on a number of accessory settings, storing the maximum levels and the corresponding settings
  - data reduction
  - final test on the accessory settings found in the preview test:
    partial scans to compensate for the limited frequency resolution of the preview sweeps;
    search for local maxima through fine tuning of the accessory (if possible)
    measurements with final detector QP (+ AV);

  EMI test receiver (relatively slow scans with **high frequency resolution**):
  - preview test with one or two scans on accessory settings, where all interesting frequencies should be detectable (exact level information may be of less interest because of the complete final test)
  - data reduction, maybe with an increased acceptance offset to compensate for the few preview settings
  - optional partial scans to detect drifting interference
  - measurements on all (predefined) accessory settings, storing the maximum levels and the corresponding settings
  - measurements with final detector QP (+ AV) on the "worst case" accessory settings
- besides the normal test results (frequency, level, etc.), **frequency lists derived from the preview or final results** will implicitly be generated, labelled with the same name as the

corresponding source results; such a frequency list might be used to perform a scan on these frequencies

- the data reduction has a very flexible design: the scan or sweep results are analysed on the one hand with the peak reduction (a level threshold of 0 dB means no reduction; a value of 10 dB means that only obvious pikes in the spectrum will come through; a value of e.g. 100 dB should block all data), on the other hand with the subrange maxima reduction (number of subranges is identical to the maximum number of results to be kept from each test range in the script): a smaller level threshold means fewer subrange maxima will remain in the end; the remaining points will be merged (only one list entry if frequencies are identical) and further filtered with an acceptance analysis (cut off all points below an imaginary acceptance line; an acceptance offset of e.g. -100 dB wouldn't filter any points); for certain tests where the measurements come close to the sensitivity limitations of the instruments, the acceptance analysis can alternatively work with an arbitrarily defined acceptance line (which means no offset in reference to a limit line) so that the acceptance line goes above the noise floor; from the remaining points only those many will be kept (the margin will be evaluated) as defined by the operator; if more broadband signals shall be kept then the level threshold for the peak reduction (which finds narrowband interference) should be set to a higher value



Before the standard scripts can be used, some data has to be imported (menu **Options**) from the **Standard Data Disk**:

- the **scripts** needed for testing plus the referring subscripts
- the **limit lines** for the required specifications
- the **probe and system transducers** that are used for the tests (the files hold typical values and - if available - should be replaced with the exact values for the transducers in use)
- for calibration tests the frequency lists if needed (for open area measurements the lists should be adapted to the ambient interference of the test site)

In addition the required **scan and / or sweep range tables** have to be imported from the corresponding **option disk(s)** for the receivers(s) in use (ES-K1x); these range tables are already adapted to the receivers and the test specifications, but they normally need some modification concerning the specified transducers (depending on the test equipment).

When a script has been started, a window will come up that enables the operator to modify the so called script parameters to control the proceedings of the test. Pressing **<ENTER>** or clicking the **OK** button (modified parameters will be stored) or the **Cancel** button (modified parameters will be ignored) will close this window and the test will run, using the stored settings of the script parameters; **Stop** aborts the test immediately.

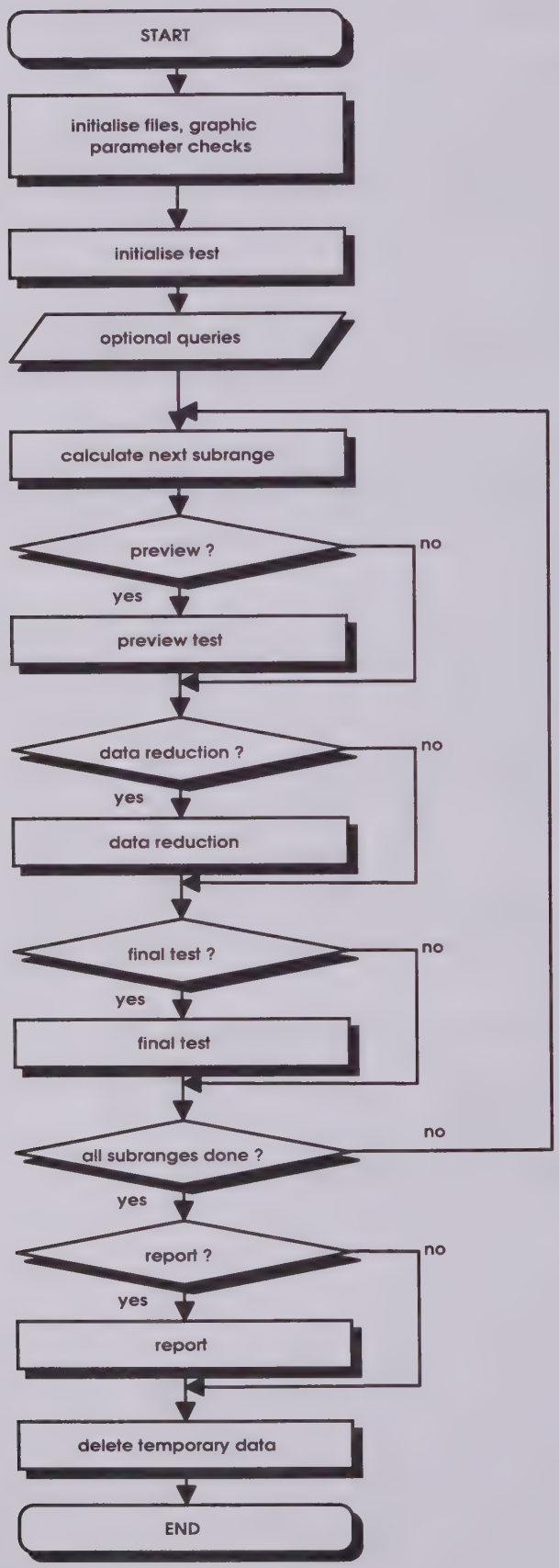
To select other (default) settings for the script parameters (e.g. to run the test with another specification), the selection box on top of the script parameter window has to be used: a list with script parameters matching those of the current test will come up; any of the given script parameter files can be chosen to replace the current parameter settings; with **Save As** new parameter sets can be created.

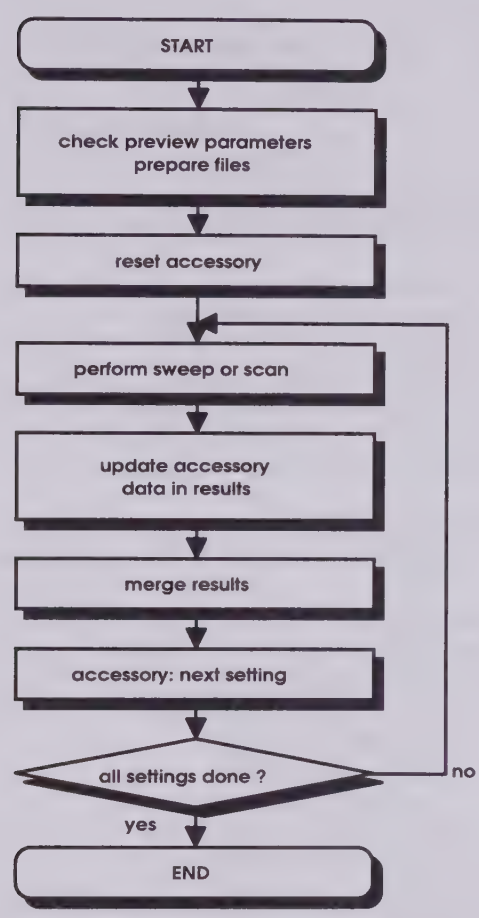
A running test may be aborted at any time with the **Stop** button (an active sweep or scan might have to be aborted before), but the measurements stored so far may be of only limited use. Afterwards the test can't be continued but restarted from the beginning.

Although the scripts provide automatic printing or plotting at the end of a test, sometimes it may be useful to skip the report, redefine some elements in the graphics configuration (e.g. line styles, colours, etc.), in the report header or in the report configuration, and then start the report with the selection of **Print...** or **Plot...** in the **File** menu.

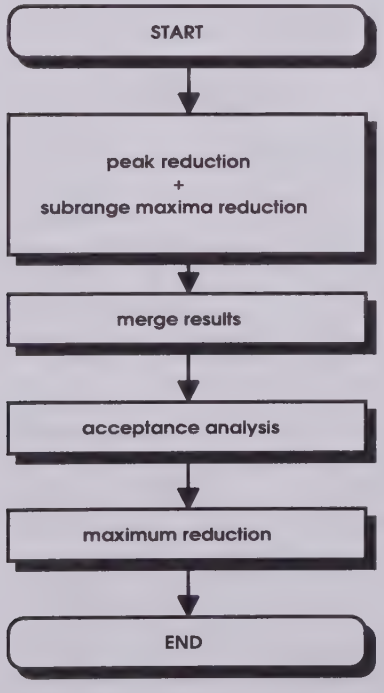
On the following pages there are some flowcharts that show in principle the steps of the tests:

Standard Test Procedure



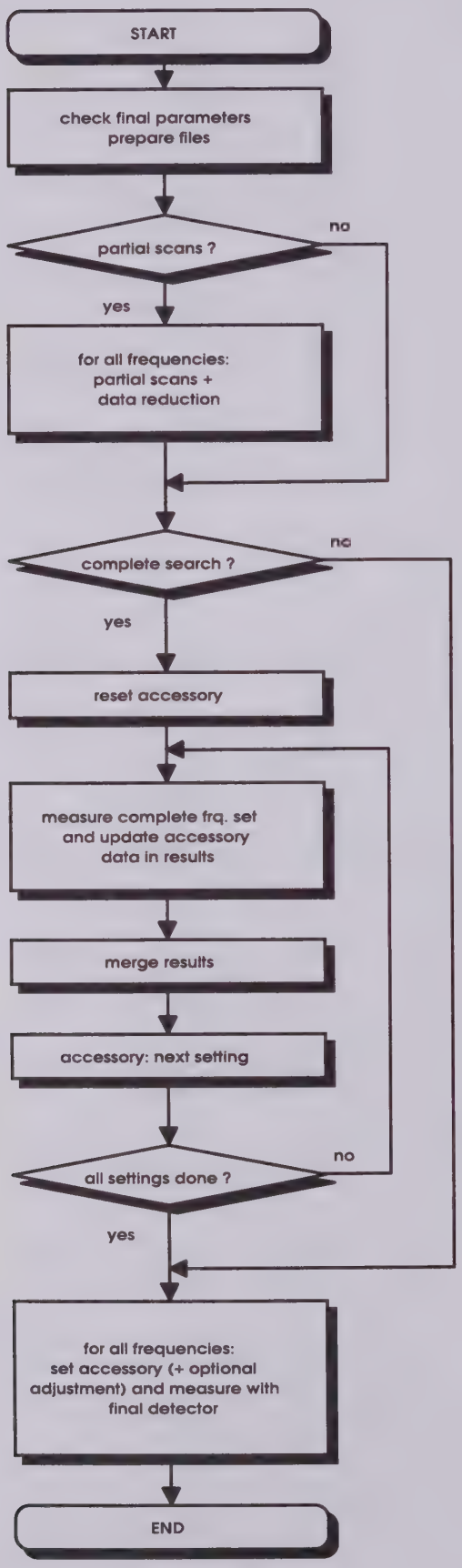


Preview Test Procedure



Data Reduction

Final Test Procedure



3.1 Voltage Mains Test

3.1.1 Description

This test provides automatic measurement of electromagnetic interference on supply lines, optionally with automatic control of an artificial mains network (LISN).

Depending on the kind of LISN, the parameters have to be set:

- with a **single line LISN** measurements are normally done on a number of (AC or DC) supply lines; switching between lines has to be done manually
- with a **2-line LISN** like the ESH3-Z5 switching can be done automatically between lines N and L1, protective earth between grounded floating (4 states in all)
- with a **4-line LISN** like the ESH2-Z5 switching can be done automatically between lines N, L1, L2 and L3, protective earth between grounded floating (8 states in all)

With test receivers the preview test (for finding the critical frequencies) is normally done on a single setting of the LISN (e.g. phase L1 with the protective earth floating).

The artificial mains networks ESH2-Z5 and ESH3-Z5 are normally controlled via the user port of the receiver. With this test procedure the parallel interface can alternatively be defined for controlling, using the LPT I/O driver. When doing so, the lines of the parallel port will be used as follows:

DATA 0 (Pin No. 2):	N
DATA 1 (Pin No. 3):	L1
DATA 2 (Pin No. 4):	L2 (ESH2-Z5only)
DATA 3 (Pin No. 5):	L3 (ESH2-Z5 only)
DATA 4 (Pin No. 6):	PE for ESH2-Z5
DATA 5 (Pin No. 7):	PE for ESH3-Z5

If needed, an **auxiliary switch** can be used for additional switching (extra shielding, different operation modes, etc.), currently with the states ON and OFF only; if activated, an extra column, holding the state of that switch, will be added to the results. If both states are defined for searching, then this will double the number of states to be analysed.

3.1.2 Parameter Sets

Currently the following specifications are supported by the ES-K1 Standard Data:

EN 55011

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Related Standards:	VDE 0875 Part 11 , CISPR 11
Test Samples:	ISM: Class B; Group 1

EN 55014

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Related Standards:	VDE 0875 Part 14 , CISPR 14
Test Samples:	Household Equipment

EN 55015

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Related Standards:	VDE 0875 Part 2 , CISPR 15
Test Samples:	Fluorescent Lamps and Luminaries

EN 55022

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Related Standards:	VDE 0878 Part 3 , CISPR 22
Test Samples:	ITE: Class B

3.1.3 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "vol_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 0.15
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 30
Function: no measurements will be done above this frequency

Parameter: 04: suppress queries as far as possible
Default value: not checked
Function: if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test

Parameter: 05: split frequency range into test ranges
Default value: checked
Function: the total frequency range of the test can optionally be split into **test ranges** (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will **be completely tested** (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency, and increasing the frequency resolution with sweeps; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter 8 has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)

Parameter: 06: if splitting of frequency range: do with log. scale
Default value: checked
Function: if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale

Parameter: 07: no. of test ranges for splitting of frequency range
Default value: 1
Function: defines the number of test ranges that shall be calculated for the splitting of the frequency range

Parameter: 08: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Preview**

Parameter: 01: preview result file, <none>: ID + '_pre PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2nd preview result file, <none>: ID + '_pre AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used

Parameter: 03: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 04: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Parameter: 05: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Topic **DataReduction**

Parameter: 01: QP limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the QUASIPEAK detector

Parameter: 02: AV limit line
Default value "<none>"
Function: a filename that corresponds to the required limit line for the AVERAGE detector

Parameter: 03: max. no. of results kept per test range
Default value 6
Function: the maximum number of results that will be kept from each test range through data reduction

Parameter: 04: decision threshold [dB] for peak reduction
Default value: 6.0
Function: determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through

Parameter: 05: level offset [dB] for acceptance analysis
Default value: -10.0
Function: determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: 06: max. no. of results kept from partial scans
Default value: 2

Function: when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction)

Parameter: 07: partial scan width: no. of IF-BWs (0=use ratio)
Default value: 0
Function: determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter

Parameter: 08: partial scan width: ref. frequ. ratio
Default value: 0.01
Function: determines the frequency range for partial scans (e.g. 0.01 means ±0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Topic **Final**

Parameter: 01: final result file, <none>: ID + '_fin QP'
Default value: "<none>"
Function: optional filename for the QUASIPEAK results from the final test; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the final test; if no filename is specified then a default name will be used

Parameter: 03: scan table for partial scans + single meas.
Default value: "<none>"
Function: filename of the corresponding **scan range table** to be used for the final test, for partial scans as well as for single measurements: for single measurements with the final detector (QP/AV) the scan range table settings will be programmed and then modified if necessary (detector and measurement time); therefore the scan range table should be defined with the PEAK (and AVERAGE) detector in combination with a short measurement time, while the other settings **have to be suitable also for QUASIPEAK measurements**

Parameter: 04: perform partial scans
Default value: not checked
Function: if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)

Parameter: 05: complete search
Default value: checked
Function: determines the search mode for the preview test: complete search means that measurements will be done on all LISN(/AUX) settings as specified with LISN(/AUX) parameters for the final test (recommended for final tests, when the preview test has not been performed as "complete search"; normally with EMI test receivers); use LISN(/AUX) data means that measurements will be done on those LISN(/AUX) settings that were determined through a "complete search" in the preview test (normally with EMI analysers)

Parameter: 06: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Parameter: 07: time [sec] for final measurements
Default value: 1.0
Function: a time that will be used for the measurements with the final detector(s); the device under test may require a minimum "duty cycle time" for full compliance testing

Parameter: 08: optional input: preview result file
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing preview result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 09: optional input: preview result file (2nd det.)
Default value: "<none>"
Function: see previous parameter

Parameter: 10: optional input: frequency list
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing frequency list can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 11: optional input: frequency list (2nd det.)
Default value: "<none>"
Function: see previous parameter

Parameter: 12: optional input: final result file
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing final result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 13: optional input: final result file (2nd det.)
Default value: "<none>"
Function: see previous parameter

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: split result display
Default value: not checked
Function: if checked then the results will be displayed with two graphics: the first shows the PEAK and QUASIPEAK results and the QUASIPEAK limit line; the second shows the AVERAGE results and the AVERAGE limit line; the name of the second diagram is based on the first one's plus "_2" appended to it

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"
Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID
Default value: ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value: "<none>"
Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "Voltage Mains Test"
Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: E.u.T. name
Default value: "E.u.T."
Function: a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""

Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed

Parameter: 07: operating conditions
Default value: ""
Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Parameter: 08: test site
Default value: ""
Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed

Parameter: 09: operator
Default value: ""
Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed

Parameter: 10: test specification
Default value: ""
Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed

Parameter: 11: comment line
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

Topic **LISN**

Parameter: 01: use manual switching only
Default value: checked
Function: if checked then manual control of the artificial mains network (LISN) through dialogue boxes will be used

Parameter: 02: use auto switching only
Default value: not checked
Function: if checked then automatic control of the artificial mains network (LISN) will be used

Parameter: 02A:use LPT I/O switching only
Default value: not checked
Function: if checked then automatic control of the artificial mains network (LISN) via the driver LPT I/O will be used; in this case the lines of the parallel port will be used as follows:

DATA 0 (Pin No. 2):	N
DATA 1 (Pin No. 3):	L1
DATA 2 (Pin No. 4):	L2 (ESH2-Z5 only)
DATA 3 (Pin No. 5):	L3 (ESH2-Z5 only)
DATA 4 (Pin No. 6):	PE for ESH2-Z5
DATA 5 (Pin No. 7):	PE for ESH3-Z5

Parameter: 03: symbolic device name of autom. switched LISN

Default value: "ESH2-Z2"
Function: symbolic device name of the automatically controlled artificial mains network as defined in the device configuration menu; the device properties must match with the controlling device (e.g. IEEE command strings for an EMI test receiver)

Parameter: 04: single line LISN
Default value: not checked
Function: if checked then a single-line-LISN for measurements on a number of supply lines is assumed

Parameter: 05: sgl.: no. of lines to be measured for preview
Default value: 0
Function: specifies the number of lines to be analysed in the preview test, if a single-line-LISN is used

Parameter: 06: sgl.: no. of lines to be measured for finals
Default value: 0
Function: specifies the number of lines to be analysed in the final test, if a single-line-LISN is used

Parameter: 07: preview measurements with PE floating
Default value: checked
Function: if checked then the preview measurements will (also) be done with the protective earth floating

Parameter: 08: preview measurements with PE grounded
Default value: checked
Function: if checked then the preview measurements will (also) be done with the protective earth grounded

Parameter: 09: preview measurements on line N
Default value: checked
Function: if checked then the preview measurements will (also) be done on the neutral line N

Parameter: 10: preview measurements on line L1
Default value: checked
Function: if checked then the preview measurements will (also) be done on the line L1

Parameter: 11: preview measurements on line L2
Default value: checked
Function: if checked then the preview measurements will (also) be done on the line L2

Parameter: 12: preview measurements on line L3
Default value: checked
Function: if checked then the preview measurements will (also) be done on the line L3

Parameter: 13: final measurements with PE floating
Default value: checked
Function: if checked then the final measurements will (also) be done with the protective earth floating

Parameter: 14: final measurements with PE grounded
Default value: checked
Function: if checked then the final measurements will (also) be done with the protective earth grounded

Parameter: 15: final measurements on line N
Default value: checked
Function: if checked then the final measurements will (also) be done on the neutral line N

Parameter: 16: final measurements on line L1
Default value: checked
Function: if checked then the final measurements will (also) be done on the line L1

Parameter: 17: final measurements on line L2
Default value: checked
Function: if checked then the final measurements will (also) be done on the line L2

Parameter: 18: final measurements on line L3
Default value: checked
Function: if checked then the final measurements will (also) be done on the line L3

Topic **Auxiliary**

Parameter: 01: use manual auxiliary switching
Default value: not checked
Function: if checked then manual control of an auxiliary switch through dialogue boxes will be used; if activated an extra column, holding the state ("ON" or "OFF") of the switch will be added to the results

Parameter: 02: name of auxiliary device
Default value: "Auxiliary Device"
Function: name of the auxiliary switch (will be displayed with the dialog boxes for switching)

Parameter: 03: preview measurements with aux. switch OFF
Default value: not checked
Function: if checked then the preview measurements will (also) be done with the state "OFF"

Parameter: 04: preview measurements with aux. switch ON
Default value: not checked
Function: if checked then the preview measurements will (also) be done with the state "ON"

Parameter: 05: final measurements with aux. switch OFF
Default value: not checked
Function: if checked then the final measurements will (also) be done with the state "OFF"

Parameter: 06: final measurements with aux. switch ON
Default value: not checked
Function: if checked then the final measurements will (also) be done with the state "ON"

3.2 Power Test

3.2.1 Description

This test provides automatic measurement of electromagnetic interference (power) using a power absorbing clamp moved along the mains cable, optionally with control of a slidebar for moving the clamp automatically.

The exact positions for the clamp settings will be calculated from the actual start and stop frequencies of the active test range through a simple but very effective algorithm (position step size depends on highest frequency, maximum position depends on lowest frequency).

With test receivers the preview test (for finding the relevant frequencies) is normally done with the absorbing clamp in the zero position, which means very close to the equipment under test (E.u.T.); with that position all critical frequencies should show up, but not necessarily with the maximum level that might be detected at an other position.

If the test chamber is not shielded properly then ambient signals might find their way into the long mains cable. The software can help: An optional frequency list with ambients can be used to cut out for each frequency a range one IF bandwidth wide that won't be further analysed; of course this method has its problems if one or more frequencies of ambient interference are identical to those critical ones of the E.u.T.

If needed, an **auxiliary switch** can be used for additional switching (extra shielding, different operation modes, etc.), currently with the states ON and OFF only; if activated, an extra column, holding the state of that switch, will be added to the results. If both states are defined for searching, then this will double the number of states to be analysed.

3.2.2 Parameter Sets

Currently the following specifications are supported by the ES-K1 Standard Data:

EN 55013

Frequency Range:	30 - 300 MHz
Detectors:	QP and AV
Related Standards:	VDE 0872 Part 13 , CISPR 13
Test Samples:	Television Sets

EN 55014

Frequency Range:	30 - 300 MHz
Detectors:	QP and AV
Related Standards:	VDE 0875 Part 14 , CISPR 14
Test Samples:	Household Equipment

3.2.3 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "pow_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 30
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 300
Function: no measurements will be done above this frequency

Parameter: 04: suppress queries as far as possible
Default value: not checked
Function: if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test

Parameter: 05: split frequency range into test ranges
Default value: checked
Function: the total frequency range of the test can optionally be split into **test ranges** (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will **be completely tested** (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency, and increasing the frequency resolution with sweeps; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter 8 has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)

Parameter: 06: if splitting of frequency range: do with log. scale
Default value: checked
Function: if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale

Parameter: 07: no. of test ranges for splitting of frequency range
Default value: 1
Function: defines the number of test ranges that shall be calculated for the splitting of the frequency range

Parameter: 08: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Preview**

Parameter: 01: preview result file, <none>: ID + '_pre PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2nd preview result file, <none>: ID + '_pre AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used

Parameter: 03: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 04: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Parameter: 05: complete search (all accessory settings)
Default value: not checked
Function: if checked sweeps/scans will be done **on all clamp settings** as specified with clamp parameters for the preview test (recommended for preview tests with sweeps, e.g. with an EMI analyser); else only one sweep/scans will be done **with <u>one</u> fixed setting** as specified with clamp parameters for the preview test (recommended for preview tests with scans, e.g. with an EMI test receiver)

Parameter: 06: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Topic **DataReduction**

Parameter: 01: QP limit line
Default value "<none>"
Function: a filename that corresponds to the required limit line for the QUASIPEAK detector

Parameter: 02: AV limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the AVERAGE detector

Parameter: 03: max. no. of results kept per test range
Default value: 10
Function: the maximum number of results that will be kept from each test range through data reduction

Parameter: 04: decision threshold [dB] for peak reduction
Default value: 20
Function: determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the

spectrum so that more results from the subrange maxima reduction will come through

Parameter: 05: level offset [dB] for acceptance analysis
Default value: -40.0
Function: determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: 06: max. no. of results kept from partial scans
Default value: 2
Function: when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction)

Parameter: 07: partial scan width: no. of IF-BWs (0=use ratio)
Default value: 0
Function: determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter

Parameter: 08: partial scan width: ref. frequ. ratio
Default value: 0.01
Function: determines the frequency range for partial scans (e.g. 0.01 means ±0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Parameter: 09 freq. list of ambients to be cut out from preview
Default value: "<none>"
Function: optional name of a frequency list (ambient interference) with frequencies to be "cut out" from measurement results (preview test: scans/sweeps, final test: partial scans), each "cut" with a range corresponding to the current IF bandwidth, e.g. +/- 60 kHz around each of the frequencies if an IF bandwidth of 120 kHz is used; to blank a modulated interference it might be necessary to provide more than one frequency in the list

Parameter: 10: cutting width for sweeps (ambients): no. of IF-BWs
Default value: 10
Function: with sweeps the width of a "cut" range (see previous parameter) has to be larger because of the lower frequency resolution of the results; therefore this factor (=number of IF bandwiths) will be used to enlarge the range compared with the range used on scan results

Topic **Final**

Parameter: 01: final result file, <none>: ID + '_fin QP'
Default value: "<none>"
Function: optional filename for the QUASIPEAK results from the final test; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the final test; if no filename is specified then a default name will be used

Parameter: 03: scan table for partial scans + single meas.
Default value: "<none>"

Function: filename of the corresponding **scan range table** to be used for the final test, for partial scans as well as for single measurements: for single measurements with the final detector (QP/AV) the scan range table settings will be programmed and then modified if necessary (detector and measurement time); therefore the scan range table should be defined with the PEAK (and AVERAGE) detector in combination with a short measurement time, while the other settings **have to be suitable also for QUASIPEAK measurements**

Parameter: 04: perform partial scans
Default value: not checked
Function: if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)

Parameter: 05: complete search
Default value: checked
Function: determines the search mode for the preview test: complete search means that measurements will be done on all clamp settings as specified with clamp parameters for the final test (recommended when the preview test has been performed with a fixed setting of the clamp); else: measurements will be done on those clamp settings that were determined through a "complete search" in the preview test

Parameter: 06: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Parameter: 07: time [sec] for final measurements
Default value: 1.0
Function: a time that will be used for the measurements with the final detector(s); the device under test may require a minimum "duty cycle time" for full compliance testing

Parameter: 08: perform accessory adjustment
Default value: checked
Function: if checked then an additional search (in a small range) for the (local) maximum level will be performed with the absorbing clamp; this is recommended, if the preview test was performed with only one or a small number of clamp settings

Parameter: 09: accessory adjustment full range
Default value: not checked
Function: if an additional search for the maximum level will be performed then not a small range will be analysed but the full positioning range of the absorbing clamp

Parameter: 10: optional input: preview result file
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing preview result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 11: optional input: preview result file (2nd det.)
Default value: "<none>"

Function: see previous parameter

Parameter: 12: optional input: frequency list
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing frequency list can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 13: optional input: frequency list (2nd det.)
Default value: "<none>"
Function: see previous parameter

Parameter: 14: optional input: final result file
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing final result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 15: optional input: final result file (2nd det.)
Default value: "<none>"
Function: see previous parameter

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: split result display
Default value: not checked
Function: if checked then the results will be displayed with two graphics: the first shows the PEAK and QUASIPEAK results and the QUASIPEAK limit line; the second shows the AVERAGE results and the AVERAGE limit line; the name of the second diagram is based on the first one's plus "_2" appended to it

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"

Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID
Default value: ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value: "<none>"
Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "Power Test"
Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: E.u.T. name
Default value: "E.u.T."
Function: a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""
Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed

Parameter: 07: operating conditions
Default value: ""
Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Parameter: 08: test site
Default value: ""
Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed

Parameter: 09: operator
Default value: ""
Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed

Parameter: 10: test specification

Default value: ""
Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed

Parameter: 11: comment line
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

Topic **Clamp**

Parameter: 01: use manual positioning only
Default value: checked
Function: if checked then manual control of the absorbing clamp through dialogue boxes will be used

Parameter: 02: use auto positioning only
Default value: not checked
Function: if checked then automatic control of the absorbing clamp will be used

Parameter: 03: symbolic name of autom. moved clamp
Default value: "CLAMP"
Function: symbolic device name of the automatically controlled absorbing clamp as defined in the device configuration menu

Parameter: 04: speed value for slower movements
Default value: 2
Function: determines the speed of the automatically moved clamp for the relatively slow movements for the "adjustment" in the final test (some 1 or 2 measurements per sec. only !)

Parameter: 05: speed value for faster movements
Default value: 6
Function: determines the speed of the automatically moved clamp for the relatively fast movements for absolute positioning

Parameter: 06: fixed/max. length [cm] to be measured (preview)
Default value: 500
Function: depending on the mode of the preview test:
complete preview search: determines the maximum length to be used for measurements
initial setting only: position to be used for measurements (normally 0 cm)

Parameter: 07: no. of steps per shortest half wave length (preview)
Default value: 3
Function: determines the number of steps that shall be measured within the first half wave of the highest frequency (of the current test range), with steadily increasing stepsize for greater distances, e.g.:
a test 60 - 200 MHz, 3 steps per shortest half wave length:
=> 3 steps within 75 cm (half wave length at 200 MHz)

=> ever increasing steps (factor is 1 + 1/3) up to 250 cm (= half wave length at 60 MHz)
=> positions: 0 / 25 / 50 / 75 / 100 / 133 / 177 / 237 / 250 cm

Parameter: 08: max. length [cm] to be measured (finals)
Default value: 500
Function: depending on the mode of the final test:
complete final search: determines the maximum distance of the absorbing clamp to be used for measurements in the final test
else: preview data will be used

Parameter: 09: no. of steps per shortest half wave length (finals)
Default value: 3
Function: determines the number of steps that shall be measured within the first half wave of the highest frequency (of the current test range), with steadily increasing stepsize for greater distances, see example above (parameter 7)

Parameter: 10: no. of steps as adjustment range (finals)
Default value: 1
Function: final test with "adjustment":
determines the number of steps that shall be taken as a position range for the adjustment of the clamp

Topic **Auxiliary**

Parameter: 01: use manual auxiliary switching
Default value: not checked
Function: if checked then manual control of an auxiliary switch through dialogue boxes will be used; if activated an extra column, holding the state ("ON" or "OFF") of the switch will be added to the results

Parameter: 02: name of auxiliary device
Default value: "Auxiliary Device"
Function: name of the auxiliary switch (will be displayed with the dialog boxes for switching)

Parameter: 03: preview measurements with aux. switch OFF
Default value: not checked
Function: if checked then the preview measurements will (also) be done with the state "OFF"

Parameter: 04: preview measurements with aux. switch ON
Default value: not checked
Function: if checked then the preview measurements will (also) be done with the state "ON"

Parameter: 05: final measurements with aux. switch OFF
Default value: not checked
Function: if checked then the final measurements will (also) be done with the state "OFF"

Parameter: 06: final measurements with aux. switch ON
Default value: not checked
Function: if checked then the final measurements will (also) be done with the state "ON"

3.3 Field Strength Test

3.3.1 Description

This test provides automatic measurement of electric field strength with antennas, optionally with control of an automatic antenna tower for setting the antenna height and polarisation automatically (two masts are also possible), as well as an automatic turntable for setting the orientation of the equipment under test (E.u.T.).

For a complete test the critical frequencies have to be measured with all settings of the three "dimensions" antenna height, antenna polarisation and turntable azimuth.
Depending on the defined stepsizes the test may become time consuming but smaller steps do not necessarily lead to significantly higher levels; normally it is better to compensate for this uncertainty through an appropriate acceptance margin (e.g. 6 dB) during the analysis.
Alternatively to the field strength preview test, a frequency list from a power test (30 - 1000 MHz, PEAK-Detektor, advantage: no expensive test chamber required, see 3.2) could be used as an input to the field strength final test; this method however is not considered as very reliable with larger E.u.T.s.

For the preview test it is important to find all disturbances from the E.u.T. (the corresponding frequencies) but because of the superimposition of emitted and reflected signals (on a metallic ground) the antenna might be positioned in a minimum for certain frequency bands; measurements should generally be done with both horizontal and vertical polarisation; the antenna should be directed both to the front and to the back of the E.u.T.; the appropriate antenna height depends on the kind of test chamber:

In a **screened chamber** (only partially applied with absorbers; not suitable for final tests but almost no ambient interference) a single mid position (ca. 2 m) seems to be sufficient but because of the many reflections some minor disturbances might be "pushed up" whereas some stronger ones may come up with a decreased level; therefore the data reduction of the preview should be done with a larger acceptance offset and more frequencies have to be kept for the final test (e.g. in the open area).
In an **anechoic chamber with metallic ground** it seems to be sufficient to measure at two positions (1 m and 2.5 m), if the distance between antenna and E.u.T. is 3 m; for greater distances (e.g. 10 m) more positions (e.g. a step size of 1 m) on the full height range (1 m up to 4 m or more) have to be analysed.
In an **anechoic chamber with ground absorbers** the reflections on the ground can be disregarded (requires a limit line lowered by 6 dB !) so that a single mid position (ca. 2 m) should be sufficient for the preview test.
An **open area test site** (OATS)is normally not suitable for automatic preview tests because of the many ambient disturbances but the software can help: An optional frequency list with ambients can be used to cut out for each frequency a range one IF bandwidth wide that won't be further analysed; of course this method has its problems if one or more frequencies of ambient interference are identical to those critical ones of the E.u.T.; in this case the operator has to find out (e.g. through switching the E.u.T. off and on if possible or by looking at the signal with a smaller IF bandwidth) whether the field strength generated by the E.u.T. is above the limit, but sometimes this can be impossible, when the ambient disturbance exceeds the limit.

The **delivered script parameters** are designed for compliance testing with measurement receivers; measurements with spectrum analysers the preview test using (fast) sweeps could be done on more settings of the mast and turntable and the final test then could run without a complete search but with partial scans and "adjustment" of antenna height and turntable azimuth.

For so called **ERP measurements** (ERP = effective radiated power; unit in dBm; power in reference to a half wave dipole) that have to include the test site attenuation, it is necessary to have an individual level correction for each polarisation, i.e., two sweep/scan tables that are identical except different system transducers will be used. A second range table for preview and final test respectively has to be defined that will be effective for all measurements with vertical polarisation, whereas the first range table will be

active with horizontal polarisation. That means the range table have different additional corrections (1. site attenuation for the corresponding polarisation and distance; 2. correction factor of the half wave dipole; 3. conversion of electrical voltage [dBuV] into electrical power [dBm]).

If two automatic antenna masts are available then each of them can be used for a complete antenna range (e.g. a biconical antenna: 30 - 300 MHz / a log. per. antenna: 300 - 1000 MHz), thus eliminating manual interaction (if signal switching is done with a relay matrix) when antennas have to be changed (a second symbolic name , e.g. "MAST2" has to be specified for mast and polarisation). To compensate for the azimuth deviation of each mast against the zero position axis of the turntable, azimuth correction values have to be defined (e.g. +20 / -20 deg).
Annotation: There are antennas now available that are suitable for the whole frequency range from 30 MHz up to 1 GHz; this way any changing of antennas can be made totally superfluous within that range.

If needed, an **auxiliary switch** can be used for additional switching (extra shielding, different operation modes, etc.), currently with the states ON and OFF only; if activated, an extra column, holding the state of that switch, will be added to the results. If both states are defined for searching, then this will double the number of states to be analysed.

3.3.2 Parameter Sets

Currently the following specifications are supported by the ES-K1 Standard Data:

EN 55011

Frequency Range:	30 - 1000 MHz
Detector:	QP
Related Standards:	VDE 0875 Part 11 , CISPR 11
Test Samples:	ISM: Class B; Group 1
Distance:	10m

EN 55022

Frequency Range:	30 - 1000 MHz
Detector:	QP
Related Standards:	VDE 0878 Part 3 , CISPR 22
Test Samples:	ITE: Class B
Distance:	10m

3.3.3 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "field_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 30
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 1000
Function: no measurements will be done above this frequency

Parameter: 04: suppress queries as far as possible
Default value: not checked
Function: if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test

Parameter: 05: split frequency range into test ranges
Default value: checked
Function: the total frequency range of the test can optionally be split into **test ranges** (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will **be completely tested** (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency, and increasing the frequency resolution with sweeps; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter 8 has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)

Parameter: 06: if splitting of frequency range: do with log. scale
Default value: checked
Function: if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale

Parameter: 07: no. of test ranges for splitting of frequency range
Default value: 1
Function: defines the number of test ranges that shall be calculated for the splitting of the frequency range

Parameter: 08: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Preview**

Parameter: 01: preview result file, <none>: ID + '_pre PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: optional 2nd preview result file, <none>: ID + '_pre AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used

Parameter: 03: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 04: optional 2nd scan table for preview (vertical)
Default value: "<none>"
Function: filename of a second scan range table for the preview test which to be used only when measurements are done with vertical polarisation; if used then the first scan range table will be used with horizontal polarisation only

Parameter: 05: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Parameter: 06: optional 2nd sweep table for preview (vertical)
Default value: "<none>"
Function: filename of a second sweep range table for the preview test which will be used only when measurements are done with vertical polarisation; if used then the first sweep range table will be used with horizontal polarisation only

Parameter: 07: complete search (all accessory settings)
Default value: not checked
Function: if checked sweeps/scans will be done **on all accessory settings** as specified with the mast/turntable/polarisation parameters for the preview test (recommended for preview tests with sweeps, e.g. with an EMI analyser); else only one sweep/scans will be done **with one fixed setting** as specified with clamp parameters for the preview test (recommended for preview tests with scans, e.g. with an EMI test receiver)

Parameter: 08: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Topic **DataReduction**

Parameter: 01: QP limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the QUASIPEAK detector

Parameter: 02: optional QP acceptance line (no offset)

Default value: "<none>"
Function: a filename of an optional limit line which will be directly used as a quasi arbitrarily defined acceptance line for the acceptance analysis during data reduction of PEAK results; if used then the given value for the acceptance offset will be ignored

Parameter: 03: optional AV limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the AVERAGE detector

Parameter: 04: optional AV acceptance line (no offset)
Default value: "<none>"
Function: a filename of an optional limit line which will be directly used as a quasi arbitrarily defined acceptance line for the acceptance analysis during data reduction of AVERAGE results; if used then the given value for the acceptance offset will be ignored

Parameter: 05: final measurements according to FCC standard
Default value: not checked
Funktion: if checked then the final measurements in the frequency range >1 GHz will be done with the AV detector instead of the QP detector (as required in the FCC regulations part 15) and the referring results will be stored in an extra result file

Parameter: 06: max. no. of results kept per test range
Default value: 6
Function: the maximum number of results that will be kept from each test range through data reduction

Parameter: 07: decision threshold [dB] for peak reduction
Default value: 6.0
Function: determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through

Parameter: 08: level offset [dB] for acceptance analysis
Default value: -10.0
Function: determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: 09: max. no. of results kept from partial scans
Default value: 2
Function: when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction)

Parameter: 10: partial scan width: no. of IF-BWs (0=use ratio)
Default value: 0
Function: determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter

Parameter: 11: partial scan width: ref. frequ. ratio
Default value: 0.01
Function: determines the frequency range for partial scans (e.g. 0.01 means ±0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Parameter: 12: freq. list of ambients to be cut out from preview
Default value: "<none>"
Function: optional name of a frequency list (ambient interference) with frequencies to be "cut out" from measurement results (preview test: scans/sweeps, final test: partial scans), each "cut" with a range corresponding to the current IF bandwidth, e.g. +/- 60 kHz around each of the frequencies if an IF bandwidth of 120 kHz is used; to blank a modulated interference it might be necessary to provide more than one frequency in the list

Parameter: 13: cutting width for sweeps (ambients): no. of IF-BWs
Default value: 10
Function: with sweeps the width of a "cut" range (see previous parameter) has to be larger because of the lower frequency resolution of the results; therefore this factor (=number of IF bandwiths) will be used to enlarge the range compared with the range used on scan results

Topic **Final**

Parameter: 01: final result file, <none>: ID + '_fin QP'
Default value: "<none>"
Function: optional filename for the QUASIPEAK results from the final test; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the final test; if no filename is specified then a default name will be used

Parameter: 03: scan table for partial scans + single meas.
Default value: "<none>"
Function: filename of the corresponding **scan range table** to be used for the final test, for partial scans as well as for single measurements: for single measurements with the final detector (QP/AV) the scan range table settings will be programmed and then modified if necessary (detector and measurement time); therefore the scan range table should be defined with the PEAK (and optional AVERAGE) detector in combination with a short measurement time, while the other settings **have to be suitable also for QUASIPEAK measurements**

Parameter: 04: optional 2nd scan table (vertical)
Default value: "<none>"
Function: filename of a second scan range table for the final test (partial scans and single measurements) which will be used only when measurements are done with vertical polarisation; if used then the first scan range table will be used with horizontal polarisation only

Parameter: 05: perform partial scans
Default value: not checked
Function: if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)

Parameter: 06: complete search
Default value: checked

Function: determines the search mode for the preview test: complete search means that measurements will be done on all mast/turntable/polarisation settings as specified with the corresponding parameters for the final test (recommended when the preview test has been performed with a fixed setting); else: measurements will be done on those mast/turntable/polarisation settings that were determined through a "complete search" in the preview test

Parameter: 07: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Parameter: 08: time [sec] for final measurements
Default value: 1.0
Function: a time that will be used for the measurements with the final detector(s); the device under test may require a minimum "duty cycle time" for full compliance testing

Parameter: 09: perform accessory adjustment
Default value: checked
Function: if checked then an additional search (in a small range) for the (local) maximum level will be performed (mast height and turntable azimuth); this is recommended, if the preview test was performed with only one or a small number of settings (mast and turntable)

Parameter: 10: accessory adjustment full range
Default value: not checked
Function: if an additional search for the maximum level will be performed then not a small range will be analysed but the full positioning range (mast and turntable)

Parameter: 11: optional input: preview result file
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing preview result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 12: optional input: preview result file (2nd det.)
Default value: "<none>"
Function: see previous parameter

Parameter: 13: optional input: frequency list
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing frequency list can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 14: optional input: frequency list (2nd det.)
Default value: "<none>"
Function: see previous parameter

Parameter: 15: optional input: final result file
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing final result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 16: optional input: final result file (2nd det.)
Default value: "<none>"
Function: see previous parameter

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"
Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID
Default value: ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value: "<none>"
Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "Field Strength Test"
Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: E.u.T. name
Default value: "E.u.T."
Function: a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""
Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed

Parameter: 07: operating conditions
Default value: ""
Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Parameter: 08: test site
Default value: ""
Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed

Parameter: 09: operator
Default value: ""
Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed

Parameter: 10: test specification
Default value: ""
Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed

Parameter: 11: comment line
Default value ""
Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

Topic **Mast**

Parameter: 01: use manual positioning only
Default value: checked
Function: if checked then manual control of the antenna mast through dialogue boxes will be used

Parameter: 02: use auto positioning only
Default value: not checked
Function: if checked then automatic control of the antenna mast will be used

Parameter: 03: symbolic name of autom. moved mast
Default value: "MAST"
Function: symbolic device name of the automatically controlled antenna mast as defined in the device configuration menu

Parameter: 04: azimuth offset [deg] of mast
Default value: 0
Function: if two automatic masts are used so that these mast are not located in the 0 degree axis of the turntable, then a **value for the azimuth correction** can be used

Parameter: 05: symbolic name of optional 2nd automatic mast
Default value: "MAST2"
Function: symbolic device name of the optional 2nd automatically controlled antenna mast as defined in the device configuration menu; to make the script run with two masts, an appropriate stop message has to be defined for each subrange in the scan/sweep tables used for the preview or final test;
example:

1st mast	"1 "	or	"1 xxxxx"	(string has to start with a
2nd Mast	"2 "	or	"2 xxxxx"	digit followed by a blank)

for a full automatic test (without manual interaction) an additional relay matrix (RSU) would have to be used for switching between antennas (the corresponding signal paths would have to be selected in the scan/sweep tables)

Parameter: 06: azimuth offset [deg] of optional 2nd mast
Default value: 0
Function: if two automatic masts are used so that these mast are not located in the 0 degree axis of the turntable, then a **value for the azimuth correction** can be used

Parameter: 07: control priority level (1=highest)
Default value: 1
Function: defines the priority level of the controlling of the antenna height (in combination with turntable azimuth and antenna polarisation): a value of 1 means highest priority, 3 means lowest priority

Parameter: 08: min. height [cm] to be measured for preview
Default value: 100
Function: depending on the mode of the preview test:

complete preview search:	minimum height to be used for measurements
else:	value will be ignored

Parameter: 09: fixed/max. height [cm] to be measured for preview
Default value: 300
Function: depending on the mode of the preview test:

complete preview search:	determines the maximum height to be used for measurements
else:	fixed height to be used for measurements

Parameter: 10: height stepsize [cm] for preview
Default value: 200
Function: stepsize for height variation in the preview test; normally two or three positions in all is sufficient (for finding all suspect frequencies), if the final test includes a complete search; this stepsize will be used in the final test as the height range for an optional "adjustment", if the final test is done without complete search

Parameter: 11: min. height [cm] to be measured for finals
Default value: 100

Function: depending on the mode of the final test:
complete final search: determines the minimum height of the mast to be used for measurements in the final test
else: preview data will be used

Parameter: 12: max. height [cm] to be measured for finals
Default value: 400
Function: depending on the mode of the final test:
complete final search: determines the maximum height of the mast to be used for measurements in the final test
else: preview data will be used

Parameter: 13: height stepsize [cm] for finals
Default value: 50
Function: stepsize for height variation in the final test; this stepsize will also be used as the height range for an optional "adjustment", if the final test is done with a complete search

Parameter: 14: speed value for slower movements
Default value: 2
Function: determines the speed of the mast for the relatively slow movements for the "adjustment" in the final test (some 1 or 2 measurements per sec. only !)

Parameter: 15: speed value for faster movements
Default value: 6
Function: determines the speed of the automatically moved mast for the relatively fast movements for absolute positioning

Topic **Turntable**

Parameter: 01: use manual positioning only
Default value: checked
Function: if checked then manual control of the turntable through dialogue boxes will be used

Parameter: 02: use auto positioning only
Default value: not checked
Function: if checked then automatic control of the turntable will be used

Parameter: 03: symbolic name of autom. moved turntable
Default value: "TURNTABLE"
Function: symbolic device name of the automatically controlled turntable as defined in the device configuration menu

Parameter: 04: control priority level (1=highest)
Default value: 2
Function: defines the priority level of the controlling of the turntable azimuth (in combination with antenna height and antenna polarisation): a value of 1 means highest priority, 3 means lowest priority

Parameter: 05: min. azimuth [deg] to be measured for preview
Default value: 90
Function: depending on the mode of the preview test:
complete preview search: minimum azimuth to be used for measurements
else: value will be ignored

Parameter: 06: fixed/max. azimuth [deg] to be measured for preview

Default value: 270
Function: depending on the mode of the preview test:
complete preview search: determines the maximum azimuth to be used for measurements
else: fixed azimuth to be used for measurements

Parameter: 07: azimuth stepsize [deg] for preview
Default value: 180
Function: stepsize for azimuth variation in the preview test; normally two positions in all is sufficient (for finding all suspect frequencies), if the final test includes a complete search; this stepsize will be used in the final test as the azimuth range for an optional "adjustment", if the final test is done without complete search

Parameter: 08: min. azimuth [deg] to be measured for finals
Default value: 0
Function: depending on the mode of the final test:
complete final search: determines the minimum azimuth of the turntable to be used for measurements in the final test
else: preview data will be used

Parameter: 09: max. azimuth [deg] to be measured for finals
Default value: 360
Function: depending on the mode of the final test:
complete final search: determines the azimuth of the turntable to be used for measurements in the final test
else: preview data will be used

Parameter: 10: azimuth stepsize [deg] for finals
Default value: 45
Function: stepsize for azimuth variation in the final test; this stepsize will also be used as the azimuth range for an optional "adjustment", if the final test is done with a complete search

Parameter: 11: speed value for slower movements
Default value: 2
Function: determines the speed of the turntable for the relatively slow movements for the "adjustment" in the final test (some 1 or 2 measurements per sec. only !)

Parameter: 12: speed value for faster movements
Default value: 6
Function: determines the speed of the automatically moved turntable for the relatively fast movements for absolute positioning

Topic **Polarisation**

Parameter: 01: use manual switching only
Default value: checked
Function: if checked then manual control of the antenna polarisation through dialogue boxes will be used

Parameter: 02: use auto switching only
Default value: not checked
Function: if checked then automatic control of the antenna polarisation will be used

Parameter: 03: symbolic name of autom. controlled polaris.
Default value: "MAST"

Function: symbolic device name of the automatically controlled antenna polarisation as defined in the device configuration menu

Parameter: 04: symbolic name of optional 2nd autom. polaris.
Default value: "<none>"
Function: symbolic device name of an optional 2nd automatically controlled antenna polarisation as defined in the device configuration menu (see also Topic Mast)

Parameter: 05: control priority level (1=highest)
Default value: 3
Function: defines the priority level of the controlling of the antenna polarisation (in combination with antenna height and turntable azimuth): a value of 1 means highest priority, 3 means lowest priority

Parameter: 06: delay time [sec] for auto switching
Default value: 4
Function: defines a waiting time with automatic switching of the antenna polarisation; the delay time depends on the mechanical system and maybe also on the weight of the antenna (the driver never gives a feedback when the switching has been completed)

Parameter: 07: preview measurements with horizontal polaris.
Default value: not checked
Function: if checked then the preview measurements will (also) be done with horizontal polarisation

Parameter: 08: preview measurements with vertical polaris.
Default value: not checked
Function: if checked then the preview measurements will (also) be done with vertical polarisation

Parameter: 09: final measurements with horizontal polaris.
Default value: not checked
Function: if checked then the final measurements will (also) be done with horizontal polarisation

Parameter: 10: final measurements with vertical polaris.
Default value: not checked
Function: if checked then the final measurements will (also) be done with vertical polarisation

Topic **Auxiliary**

Parameter: 01: use manual auxiliary switching
Default value: not checked
Function: if checked then manual control of an auxiliary switch through dialogue boxes will be used; if activated an extra column, holding the state ("ON" or "OFF") of the switch will be added to the results

Parameter: 02: name of auxiliary device
Default value: "Auxiliary Device"
Function: name of the auxiliary switch (will be displayed with the dialog boxes for switching)

Parameter: 03: preview measurements with aux. switch OFF
Default value: not checked
Function: if checked then the preview measurements will (also) be done with the state "OFF"

Parameter: 04: preview measurements with aux. switch ON

Default value: not checked
Function: if checked then the preview measurements will (also) be done with the state "ON"

Parameter: 05: final measurements with aux. switch OFF
Default value: not checked
Function: if checked then the final measurements will (also) be done with the state "OFF"

Parameter: 06: final measurements with aux. switch ON
Default value: not checked
Function: if checked then the final measurements will (also) be done with the state "ON"

3.4 Magnetic Field Strength Test

3.4.1 Description

This test provides automatic measurement of magnetic interference, optionally with automatic control of a triple loop antenna like the R&S HM020.

An **open area test site** (OATS)is normally not suitable for automatic preview tests because of the many ambient disturbances but the software can help: An optional frequency list with ambients can be used to cut out for each frequency a range one IF bandwidth wide that won't be further analysed; of course this method has its problems if one or more frequencies of ambient interference are identical to those critical ones of the E.u.T.; in this case the operator has to find out (e.g. through switching the E.u.T. off and on if possible or by looking at the signal with a smaller IF bandwidth) whether the field strength generated by the E.u.T. is above the limit, but sometimes this can be impossible, when the ambient disturbance exceeds the limit.

3.4.2 Parameter Sets

Currently the following specifications are supported by the ES-K1 Standard Data:

VDE0875/211

Frequency Range:	0.009 - 30 MHz
Detector:	QP
Related Standards:	CISPR 11
Test Samples:	ISM

3.4.3 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "mfield_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 0.09
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 30
Function: no measurements will be done above this frequency

Parameter: 04: suppress queries as far as possible
Default value: not checked
Function: if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test

Parameter: 05: split frequency range into test ranges
Default value: checked
Function: the total frequency range of the test can optionally be split into **test ranges** (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will **be completely tested** (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency, and increasing the frequency resolution with sweeps; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter 8 has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)

Parameter: 06: if splitting of frequency range: do with log. scale
Default value: checked
Function: if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale

Parameter: 07: no. of test ranges for splitting of frequency range
Default value: 1
Function: defines the number of test ranges that shall be calculated for the splitting of the frequency range

Parameter: 08: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Preview**

Parameter: 01: preview result file, <none>: ID + '_pre PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2nd preview result file, <none>: ID + '_pre AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used

Parameter: 03: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 04: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Parameter: 05: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten;
else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Topic **DataReduction**

Parameter: 01: QP limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the QUASIPEAK detector

Parameter: 02: AV limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the AVERAGE detector

Parameter: 03: max. no. of results kept per test range
Default value: 6
Function: the maximum number of results that will be kept from each test range through data reduction

Parameter: 04: decision threshold [dB] for peak reduction
Default value: 6.0
Function: determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through

Parameter: 05: level offset [dB] for acceptance analysis
Default value: -10.0
Function: determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: 06: max. no. of results kept from partial scans

Default value: 2
Function: when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction)

Parameter: 07: partial scan width: no. of IF-BWs (0=use ratio)
Default value: 0
Function: determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter

Parameter: 08: partial scan width: ref. frequ. ratio
Default value: 0.01
Function: determines the frequency range for partial scans (e.g. 0.01 means ±0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Parameter: 09 freq. list of ambients to be cut out from preview
Default value: "<none>"
Function: optional name of a frequency list (ambient interference) with frequencies to be "cut out" from measurement results (preview test: scans/sweeps, final test: partial scans), each "cut" with a range corresponding to the current IF bandwidth, e.g. +/- 60 kHz around each of the frequencies if an IF bandwidth of 120 kHz is used; to blank a modulated interference it might be necessary to provide more than one frequency in the list

Parameter: 10: cutting width for sweeps (ambients): no. of IF-BWs
Default value: 10
Function: with sweeps the width of a "cut" range (see previous parameter) has to be larger because of the lower frequency resolution of the results; therefore this factor (=number of IF bandwiths) will be used to enlarge the range compared with the range used on scan results

Topic **Final**

Parameter: 01: final result file, <none>: ID + '_fin QP'
Default value: "<none>"
Function: optional filename for the QUASIPEAK results from the final test; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the final test; if no filename is specified then a default name will be used

Parameter: 03: scan table for partial scans + single meas.
Default value: "<none>"
Function: filename of the corresponding **scan range table** to be used for the final test, for partial scans as well as for single measurements: for single measurements with the final detector (QP/AV) the scan range table settings will be programmed and then modified if necessary (detector and measurement time); therefore the scan range table should be defined with the PEAK (and AVERAGE) detector in combination with a short measurement time, while the other settings **have to be suitable also for QUASIPEAK measurements**

Parameter: 04: perform partial scans

Default value: not checked
Function: if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)

Parameter: 05: complete search
Default value: checked
Function: determines the search mode for the preview test:
complete search means that measurements will be done on all loop antenna settings as specified with loop antenna parameters for the final test (recommended when the preview test has been performed with a fixed setting of the loop antenna);
else: measurements will be done on those loop antenna settings that were determined through a "complete search" in the preview test

Parameter: 06: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Parameter: 07: time [sec] for final measurements
Default value: 1.0
Function: a time that will be used for the measurements with the final detector(s); the device under test may require a minimum "duty cycle time" for full compliance testing

Parameter: 08: optional input: preview result file
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing preview result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 09: optional input: preview result file (2nd det.)
Default value: "<none>"
Function: see previous parameter

Parameter: 10: optional input: frequency list
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing frequency list can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 11: optional input: frequency list (2nd det.)
Default value: "<none>"
Function: see previous parameter

Parameter: 12: optional input: final result file
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing final result file can be specified as an input for the final test, one (for QP+AV) or optionally two (1st for QP, 2nd for AV) input files

Parameter: 13: optional input: final result file (2nd det.)

Default value: "<none>"
Function: see previous parameter

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"
Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID
Default value ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value "<none>"
Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "Magn. Field Strength Test"

Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: E.u.T. name
Default value: "E.u.T."
Function: a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""
Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed

Parameter: 07: operating conditions
Default value: ""
Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Parameter: 08: test site
Default value: ""
Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed

Parameter: 09: operator
Default value: ""
Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed

Parameter: 10: test specification
Default value: ""
Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed

Parameter: 11: comment line
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

Topic **LoopAntenna**

Parameter: 01: use manual switching only
Default value: checked
Function: if checked then manual control of the loop antenna through dialogue boxes will be used

Parameter: 02: use auto switching only
Default value: not checked
Function: if checked then automatic control of the triple loop antenna will be used

Parameter: 03: symbolic name of autom. switched triple loop
Default value: "HM020"

Function: symbolic device name of the automatically controlled triple loop antenna as defined in the device configuration menu; the device properties must match with the controlling device (e.g. IEEE command strings for an EMI test receiver)

Parameter: 04: preview measurements on loop X
Default value: checked
Function: if checked then the preview measurements will (also) be done with the antenna loop "X"

Parameter: 05: preview measurements on loop Y
Default value: checked
Function: if checked then the preview measurements will (also) be done with the antenna loop "Y"

Parameter: 06: preview measurements on loop Z
Default value: checked
Function: if checked then the preview measurements will (also) be done with the antenna loop "Z"

Parameter: 07: final measurements on loop X
Default value: checked
Function: if checked then the final measurements will (also) be done with the antenna loop "X"

Parameter: 08: final measurements on loop Y
Default value: checked
Function: if checked then the final measurements will (also) be done with the antenna loop "Y"

Parameter: 09: final measurements on loop Z
Default value: checked
Function: if checked then the final measurements will (also) be done with the antenna loop "Z"

3.5 MIL STD 461/462 C Test

3.5.1 Description

This test provides automatic measurement of conducted and radiated electromagnetic interference according to the American MIL STD 461/462 C specifications. Some of the specifications require a classification for narrowband (NB) and broadband (BB) signals.
A NB/BB discrimination can be done only on scan results (from a preview scan or from partial scans in the final test); single measurements will not be performed.
To make use of the PK-AV method the selected scan table has to be defined with exactly these detectors (1st PK, 2nd AV).
The tuning methods require certain scan step sizes, depending on the defined IF bandwidth; for the points at the edge of the scan table's subranges there won't be any NB/BB results because the algorithm works within these subranges only.
The PK-AV method is the most reliable discrimination method but the scans require more time to perform (two detectors).
Above 1 GHz no discrimination will be done; for that frequency range the specifications don't have BB limits.

3.5.2 Parameter Sets

Currently the following specifications are supported by the ES-K1 Standard Data:

MIL STD 461 C CE01

Frequency Range:	0.03 - 15 kHz
Detector:	Pk (NB)
Related Standards:	-
Test Samples:	Part 3 Equipment

MIL STD 461 C CE03

Frequency Range	0.015 - 50 MHz
Detector:	Pk (NB), Pk/MHz (BB)
Related Standards	-
Test Samples	Part 3 Equipment: Navy and Airforce

MIL STD 461 C RE01

Frequency Range	0.03 - 50 kHz
Detector:	Pk (NB)
Related Standards	-
Test Samples:	Part 3 Equipment

MIL STD 461 C RE02

Frequency Range:	0.014 - 10000 MHz (NB), 0.014 - 1000 MHz (BB)
Detector:	Pk (NB), Pk/MHz (BB)
Related Standards:	-
Test Samples:	Part 3 Equipment (Curve #1)

3.5.3 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "mil_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 30e-6
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 10e3
Function: no measurements will be done above this frequency

Parameter: 04: suppress queries as far as possible
Default value: not checked
Function: if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test

Parameter: 05: split frequency range into test ranges
Default value: checked
Function: the total frequency range of the test can optionally be split into **test ranges** (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will **be completely tested** (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency, and increasing the frequency resolution with sweeps; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter 8 has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)

Parameter: 06: if splitting of frequency range: do with log. scale
Default value: checked
Function: if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale

Parameter: 07: no. of test ranges for splitting of frequency range
Default value: 1
Function: defines the number of test ranges that shall be calculated for the splitting of the frequency range

Parameter: 08: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Preview**

Parameter: 01: preview result file, <none>: ID + '_pre PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2nd preview result file, <none>: ID + '_pre AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used

Parameter: 03: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 04: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Parameter: 05: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Topic **DataReduction**

Parameter: 01: NB limit line
Default value: "<none>"
Function: a filename that corresponds to the required NB limit line

Parameter: 02: optional NB acceptance line (no offset)
Default value: "<none>"
Function: a filename of an optional limit line which will be directly used as a quasi arbitrarily defined acceptance line for the acceptance analysis during data reduction of NB results; if used then the given value for the acceptance offset will be ignored

Parameter: 03: BB limit line
Default value: "<none>"
Function: a filename that corresponds to the required BB limit line

Parameter: 04: optional BB acceptance line (no offset)
Default value: "<none>"
Function: a filename of an optional limit line which will be directly used as a quasi arbitrarily defined acceptance line for the acceptance analysis during data reduction of BB results; if used then the given value for the acceptance offset will be ignored

Parameter: 05: max. no. of results kept per test range
Default value: 6
Function: the maximum number of results that will be kept from each test range through data reduction

Parameter: 06: decision threshold [dB] for peak reduction
Default value: 6.0

Function: determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through

Parameter: 07: level offset [dB] for acceptance analysis
Default value: -10.0
Function: determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: 08: max. no. of results kept from partial scans
Default value: 2
Function: when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction)

Parameter: 09: partial scan width: no. of IF-BWs (0=use ratio)
Default value: 0
Function: determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter

Parameter: 10: partial scan width: ref. frequ. ratio
Default value: 0.01
Function: determines the frequency range for partial scans (e.g. 0.01 means ±0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Parameter: 11: 0/1/2/3: NB/BB discr.: none/tun1BW/tun2BW/PK-AV
Default value: 2
Function: type of narrowband/broadband discrimination:
no discrimination / tuning method +/- 1 IF bandwidth / tuning method +/- 2 IF bandwidths / PK/AV comparison method

Parameter: 12: decision threshold [dB] for NB/BB reduction
Default value: 6.0
Function: determines the decision level threshold for the selected NB/BB discrimination; recommended values are 6 dB for the tuning methods and 12 dB for the PK-AV comparison method

Parameter: 13: max. no. of BB results kept per octave
Default value: 3
Function: maximum number of BB results to be kept per octave from the final results

Topic **Final**

Parameter: 01: final NB result file, default: ID + '_fin NB'
Default value: "<none>"
Function: optional filename for the NB results from the final test; if no filename is specified then a default name will be used

Parameter: 02: final BB result file, default: ID + '_fin BB'
Default value: "<none>"
Function: optional filename for the BB results from the final test; if no filename is specified then a default name will be used

Parameter: 03: scan table for partial scans
Default value: "<none>"
Function: filename of the corresponding **scan range table** to be used for partial scans in the final test

Parameter: 04: perform partial scans
Default value: not checked
Function: if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)

Parameter: 05: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Topic **Graphic**

Parameter: 01: NB graphics configuration, default: ID + ' NB'
Default value: "<none>"
Function: optional filename for the graphics configuration to be used for the NB results; if no filename is specified then a default name will be used

Parameter: 02: BB graphics configuration, default: ID + ' BB'
Default value: "<none>"
Function: optional filename for the graphics configuration to be used for the BB results; if no filename is specified then a default name will be used

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"
Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID

Default value: ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value: "<none>"
Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "MIL STD 461/462C Test"
Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: E.u.T. name
Default value: "E.u.T."
Function: a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""
Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed

Parameter: 07: operating conditions
Default value: ""
Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Parameter: 08: test site
Default value: ""
Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed

Parameter: 09: operator
Default value: ""
Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed

Parameter: 10: test specification
Default value: ""
Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed

Parameter: 11: comment line
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

3.6 EMI MIL Test

3.6.1 Description

This test provides automatic measurement of conducted and radiated electromagnetic interference according to those specifications that do not require a classification for narrowband (NB) and broadband (BB) signals (e.g. MIL STD 461/462 D, DEF-STAN, etc.). The test starts with a preview test (sweep or scan with single detector) and does a data reduction. In the final test optionally partial scans can be performed; at all critical points simple single measurements - based on a scan table - will be done.

3.6.2 Parameter Sets

Currently the following specifications are supported by the ES-K1 Standard Data:

MIL STD 461 D CE101

Frequency Range:	0.03 - 10 kHz
Detector:	Pk
Related Standards:	-
Test Samples:	Power Leads

MIL STD 461 D CE102

Frequency Range:	0.01 - 10 MHz
Detector:	Pk
Related Standards:	-
Test Samples:	Power Leads

MIL STD 461 D RE101

Frequency Range:	0.03 - 100 kHz
Detector:	Pk
Related Standards:	-
Test Samples:	Magnetic Field Emissions

MIL STD 461 D RE102

Frequency Range:	10 kHz - 18 GHz
Detector:	Pk
Related Standards:	-
Test Samples:	Electric Field Emissions

3.6.3 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "emi_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 30e-6
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 10e3
Function: no measurements will be done above this frequency

Parameter: 04: suppress queries as far as possible
Default value: not checked
Function: if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test

Parameter: 05: split frequency range into test ranges
Default value: checked
Function: the total frequency range of the test can optionally be split into **test ranges** (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will **be completely tested** (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency, and increasing the frequency resolution with sweeps; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter 8 has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)

Parameter: 06: if splitting of frequency range: do with log. scale
Default value: checked
Function: if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale

Parameter: 07: no. of test ranges for splitting of frequency range
Default value: 1
Function: defines the number of test ranges that shall be calculated for the splitting of the frequency range

Parameter: 08: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Preview**

Parameter: 01: preview result file, <none>: ID + '_pre'
Default value: "<none>"
Function: optional filename for the (PEAK) results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 03: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Parameter: 04: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Topic **DataReduction**

Parameter: 01: limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line

Parameter: 02: optional acceptance line (no offset)
Default value: "<none>"
Function: a filename of an optional limit line which will be directly used as a quasi arbitrarily defined acceptance line for the acceptance analysis during data reduction; if used then the given value for the acceptance offset will be ignored

Parameter: 03: max. no. of results kept per test range
Default value: 6
Function: the maximum number of results that will be kept from each test range through data reduction

Parameter: 04: decision threshold [dB] for peak reduction
Default value: 6.0
Function: determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through

Parameter: 05: level offset [dB] for acceptance analysis
Default value: -10.0
Function: determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: 06: max. no. of results kept from partial scans
Default value: 2

Function: when a partial scan is performed then after data reduction there might still be more than one significant frequency linked to interference; this parameter limits the number of results from a partial scan (after data reduction)

Parameter: 07: partial scan width: no. of IF-BWs (0=use ratio)
Default value: 0
Function: determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter

Parameter: 08: partial scan width: ref. frequ. ratio
Default value: 0.01
Function: determines the frequency range for partial scans (e.g. 0.01 means ±0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Topic **Final**

Parameter: 01: final result file, <none>: ID + '_fin'
Default value: "<none>"
Function: optional filename for the (PEAK) results from the final test; if no filename is specified then a default name will be used

Parameter: 02: scan table for partial scans + single meas.
Default value: "<none>"
Function: filename of the corresponding **scan range table** to be used for the final test, for partial scans as well as for single measurements

Parameter: 03: perform partial scans
Default value: not checked
Function: if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)

Parameter: 04: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Parameter: 05: time [sec] for final measurements
Default value: 1.0
Function: a time that will be used for the measurements with the final detector(s); the device under test may require a minimum "duty cycle time" for full compliance testing

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"
Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID
Default value: ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value: "<none>"
Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "EMI MIL Test"
Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: E.u.T. name
Default value: "E.u.T."
Function: a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""

Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed

Parameter: 07: operating conditions
Default value: ""
Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Parameter: 08: test site
Default value: ""
Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed

Parameter: 09: operator
Default value: ""
Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed

Parameter: 10: test specification
Default value: ""
Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed

Parameter: 11: comment line
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

3.7 Cable Calibration

3.7.1 Description

This test provides measuring cable transducers or any other system transducers (e.g. impedance converters, preamplifiers, attenuators, filters, etc.). The main result of the test is a system transducer table that can directly be used for level correction in the ES-K1 (scan/sweep tables).
The test can be performed with a scan or a sweep (plus data reduction), as well as on a given frequency list.
Since the test represents a two-gate measurement, a scan or sweep table has to be used that activates the tracking generator of the instrument; an "empty" (dummy) transducer (or simply "<none>") has to be declared as the probe transducer. For scan tables it is recommended to use the average detector in combination with a very small IF bandwidth.

3.7.2 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "cable_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 0.1
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 1000
Function: no measurements will be done above this frequency

Parameter: 04: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Calibration**

Parameter: 01: result file (default: ID)
Default value: "<none>"
Function: optional filename for the results from the test (filetype is system transducer); if no filename is specified then a default name will be used

Parameter: 02: scan table for measurements
Default value: "CAL"
Function: filename of the scan range table to be used for the test

Parameter: 03: optional frequency list for single measurements
Default value: "CAL"
Function: filename of an optional frequency list to be used for single measurements; this frequency list can be used only in combination with a scan table

Parameter: 04: sweep table for measurements
Default value: "<none>"
Function: filename of the sweep range table to be used for the test

Parameter: 05: no. of results kept from scan/sweep
Default value: 20
Function: the number of results that shall be kept from a scan or sweep through data reduction (if no single measurements according to a frequency list are done)

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"
Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID
Default value: ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value: "<none>"
Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "Cable Calibration"
Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: cable name
Default value: "Cable"
Function: a string that will be taken as the description of the test object; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""

Function:	a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed
Parameter:	07: operating conditions
Default value:	""
Function:	a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed
Parameter:	08: test site
Default value:	""
Function:	a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed
Parameter:	09: operator
Default value:	""
Function:	a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed
Parameter:	10: test specification
Default value:	""
Function:	a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed
Parameter:	11: comment line
Default value:	""
Function:	a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed
Parameter:	12: 2nd comment line (empty field: start time)
Default value:	""
Function:	a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

3.8 Probe Calibration

3.8.1 Description

This test provides measuring of the transducer factor of antennas or any other probes through a comparing test with a probe of known transducer factor. The main result of the test is a probe transducer table that can directly be used for level correction in the ES-K1 (scan/sweep tables).
The test can be performed with a scan or a sweep (plus data reduction), as well as on a given frequency list.
For open area test site (OATS) measurements, the test should run using a frequency list that has been modified so that any measurement of ambient signals will never happen.
Since the test represents a two-gate measurement, a scan or sweep table has to be used that activates the tracking generator of the instrument; an "empty" (dummy) transducer (or simply "<none>") has to be declared as the probe transducer. For scan tables it is recommended to use the average detector in combination with a very small IF bandwidth.
Calibration of antennas is done best with vertical polarisation and at a preferably high position (e.g. 4 m); the antennas should be mounted in a way so that their axes match exactly.

3.8.2 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "probe_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 0.1
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 1000
Function: no measurements will be done above this frequency

Parameter: 04: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Calibration**

Parameter: 01: result file (default: ID)
Default value: "<none>"
Function: optional filename for the results from the test (filetype is probe transducer); if no filename is specified then a default name will be used

Parameter: 02: scan table for measurements
Default value: "CAL"
Function: filename of the scan range table to be used for the test

Parameter: 03: optional frequency list for single measurements
Default value: "CAL"
Function: filename of an optional frequency list to be used for single measurements; this frequency list can be used only in combination with a scan table

Parameter: 04: sweep table for measurements
Default value: "<none>"
Function: filename of the sweep range table to be used for the test

Parameter: 05: no. of results kept from scan/sweep
Default value: 20
Function: the number of results that shall be kept from a scan or sweep through data reduction (if no single measurements according to a frequency list are done)

Parameter: 05: receive antenna reference probe transd. table
Default value: "<none>"
Function: probe transducer to be used for the reference measurements (transducer correction of the receiving antenna)

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID

Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"
Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID
Default value: ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value: "<none>"
Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "Probe Calibration"
Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: probe name
Default value: "Probe"

Function: a string that will be taken as the description of the test object; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""
Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed

Parameter: 07: operating conditions
Default value: ""
Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Parameter: 08: test site
Default value: ""
Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed

Parameter: 09: operator
Default value: ""
Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed

Parameter: 10: test specification
Default value: ""
Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed

Parameter: 11: comment line
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

Topic **Mast**

Parameter: 01: use manual positioning only
Default value: checked
Function: if checked then manual control of the antenna mast through dialogue boxes will be used

Parameter: 02: use auto positioning only
Default value: not checked
Function: if checked then automatic control of the antenna mast will be used

Parameter: 03: symbolic name of autom. moved mast
Default value: "MAST"
Function: symbolic device name of the automatically controlled antenna mast as defined in the device configuration menu

Parameter: 04: antenna height [cm] for antenna mounting
Default value: 100

Function: defines the antenna height for mounting of the antenna (at the beginning and at the end of the test, each time with horizontal polarisation)

Parameter: 04: antenna height [cm] for measurements
Default value: 400
Function: defines the antenna height for the measurements

Topic **Polarisation**

Parameter: 01: use manual switching only
Default value: checked
Function: if checked then manual control of the antenna polarisation through dialogue boxes will be used

Parameter: 02: use auto switching only
Default value: not checked
Function: if checked then automatic control of the antenna polarisation will be used

Parameter: 03: symbolic name of autom. controlled polaris.
Default value: "MAST"
Function: symbolic device name of the automatically controlled antenna polarisation as defined in the device configuration menu

Parameter: 04: delay time [sec] for auto switching
Default value: 4
Function: defines a waiting time with automatic switching of the antenna polarisation; the delay time depends on the mechanical system and maybe also on the weight of the antenna (the driver never gives a feedback when the switching has been completed)

Parameter: 05: measurements with horizontal polaris. only
Default value: not checked
Function: if checked then the all measurements will be done with horizontal polarisation only

Parameter: 06: measurements with vertical polaris. only
Default value: checked
Function: if checked then the all measurements will be done with vertical polarisation only

3.9 Site Attenuation

3.9.1 Description

This test provides measuring of the normalized site attenuation (NSA).
The test can be performed with a scan or a sweep (plus data reduction), as well as on a given frequency list (also necessary for measurements with tuned dipoles).
For open area test site (OATS) measurements, the test should run with single measurements on a frequency list that has been modified so that measurements of ambient signals will never happen.
With a spectrum analyser in combination with broadband antennas, measurement is also possible through continuous sweeps while the antenna captures the whole height range (as described in CISPR 16-1: "swept frequency method").

Since the test represents a two-gate measurement, a scan or sweep table has to be used that activates the tracking generator of the instrument; an "empty" (dummy) transducer (or simply "<none>") has to be declared as the probe transducer. The transducers tables of the transmit and receive antennas have to be selected with the script parameters for each subrange (max. 5) of the scan/sweep table. For scan tables it is recommended to use the average detector in combination with a very small IF bandwidth.

The ideal NSA is defined as a limit line; its name indicates the significant parameters of the test, including antenna type (tuned half wave **D**ipole or **B**roadband), distance between antennas (3 / 10 / 30 m), height of the transmit antenna (1 / 1.5 / 2 / 2.7 m) and antenna polarisation (horizontal or vertical).
Example: "NSA B 10m h=1m ver" means
- antenna type = broad band dipole
- distance between antennas = 10 m
- height of transmit antenna = 1 m
- polarisation of antennas = vertical

The following test setups are currently supported directly (see also CISPR 16, CISPR 22):

NSA B 3m h=2m hor
NSA B 3m h=1m ver
NSA B 3m h=1.5m ver

NSA B 10m h=1m hor
NSA B 10m h=2m hor
NSA B 10m h=1m ver
NSA B 10m h=1.5m ver

NSA B 30m h=1m hor
NSA B 30m h=2m hor
NSA B 30m h=1m ver

NSA D 3m h=2m hor
NSA D 3m h=2.7m ver

NSA D 10m h=2m hor
NSA D 10m h=2.7m ver

NSA D 30m h=2m hor
NSA D 30m h=2.7m ver

Optionally an additional correction (mutual impedance correction, defined as a system transducer) can be used to compensate for the coupling effects of the antennas in the near field (so far the mutual

impedance correction is defined only for tuned dipoles antennas 3 m apart; see CISPR 16-1 and CISPR 22).
Example: "CPL D 3m h=1m hor" means
- antenna type = tuned half wave dipole
- distance between antennas = 3 m
- height of transmit antenna = 1 m
- polarisation of antennas = horizontal

To retrieve reference levels, a reference measurement will be done first for each subrange, which means that the cables that are normally connected to the antennas have to be put directly together. Once the reference levels have been stored (as a system transducer) they can be used again for further NSA tests.

The names of the transducer tables that refer to the transmitting and to the receiving antennas have to be specified for each (max. 5) range (of the scan / sweep table), as well as the stepsize for the height variation of the receiving antenna.

The NSA will be displayed with two diagrams, one for the absolute representation of the ideal and the measured NSA, and one for the relative representation of the measured NSA in comparison to the ideal NSA.

The columns of the result list contain the following:
* frequency
* measured level
* measured reference level
* measured NSA
  (measured level, corrected with reference level, mutual impedance correction and antenna transducer corrections)
* ideal NSA
* deviation of the measured NSA from the ideal NSA
* antenna height of minimum attenuation (not with continuous sweeps during height variation)

3.9.2 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "site_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 30
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 1000
Function: no measurements will be done above this frequency

Parameter: 04: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **NSA**

Parameter: 01: NSA name (defined as limit line)
Default value: "<none>"
Function: filename of the ideal NSA, defined as a limit line

Parameter: 02: opt. mutual imped. correction (defined as system transd.)
Default value: "<none>"
Function: filename of the optional mutual impedance correction to compensate for the coupling effects of the antennas in the near field, defined as a system transducer

Parameter: 03: result file (default: ID)
Default value: "<none>"
Function: optional filename for the results from the test (filetype is system transducer); if no filename is specified then a default name will be used

Parameter: 04: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the test will be deleted/overwritten;
else: any existing result files will only partly be overwritten (within the specified frequency range):
therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Parameter: 05: name of correction factor from reference
Default value: "NSA Reference"
Function: filename of the reference correction, stored as a system transducer:
if a reference measurement will be done, then first then before the actual NSA test there will be measurements with the coaxial cables connected directly together; these results will be stored as a system transducer so that any further NSA tests can use these results - if the same cables are used - without another reference measurement (see next parameter)

Parameter: 06: create new reference factor (else: use given factor)
Default value: checked
Function: if checked then a reference measurement will be performed and stored as a system transducer with the given name (see previous parameter); else no reference measurements will be done but the selected system transducer will be taken as the corresponding reference measurement result

Parameter: 07: scan table for measurements
Default value: "CAL"
Function: filename of the scan range table to be used for the test

Parameter: 08: opt. frequency list for single meas. mode
Default value: "CAL"
Function: filename of an optional frequency list to be used for single measurements; this frequency list can be used only in combination with a scan table

Parameter: 09: tuned dipoles (with single meas. only)
Default value: not checked
Function: if checked then with each new frequency the antenna will be put to horizontal polarisation, set to the lowest height and the required dipole length be displayed; for measurements with vertical polarisation the lowest position depends on the length of the dipoles; this mode can be used only in combination with single measurements based on a frequency list

Parameter: 10: sweep table for measurements
Default value: "<none>"
Function: filename of the sweep range table to be used for the test

Parameter: 11: continuous sweeping (with sweep table only)
Default value: not checked
Function: if checked then the antenna won't be moved step by step but continuously (and preferably slowly) over the whole range (upwards + down) while new sweeps will start all the time (see also CISPR 16-1: "swept frequency method"); this mode can be used only in combination with a selected sweep table and represents the fastest method although without information about corresponding antenna heights

Parameter: 12: time [sec] for single measurements
Default value: 1.0
Function: a time that will be used for the single measurements based on a frequency list, regardless of the setting in the scan table

Parameter: 13: NSA tolerance [dB]
Default value: 4.0
Function: tolerance level for the maximum deviation of the measured NSA from the ideal NSA (parameter will be used with a later version)

Parameter: 14: no. of results kept from scan/sweep per range
Default value: 20
Function: the number of results that shall be kept from a scan or sweep through data reduction (if no single measurements according to a frequency list are done)

Topic **Antennas**

Parameter: 01: 1st range: transmit antenna probe transd. table
Default value: "<none>"

Function: filename of the transducer table of the transmit antenna to be used for the 1st subrange of the scan/sweep table

Parameter: 02: 1st range: receive antenna probe transd. table
Default value: "<none>"
Function: filename of the transducer table of the receive antenna to be used for the 1st subrange of the scan/sweep table

Parameter: 03: 1st range: height step size [cm]
Default value: 20
Function: stepsize for the antenna movements to be used for the 1st subrange of the scan/sweep table

Parameter: 04: 2nd range: transmit antenna probe transd. table
Default value: "<none>"
Function: filename of the transducer table of the transmit antenna to be used for the 2nd subrange of the scan/sweep table

Parameter: 05: 2nd range: receive antenna probe transd. table
Default value: "<none>"
Function: filename of the transducer table of the receive antenna to be used for the 2nd subrange of the scan/sweep table

Parameter: 06: 2nd range: height step size [cm]
Default value: 10
Function: stepsize for the antenna movements to be used for the 2nd subrange of the scan/sweep table

Parameter: 07: 3rd range: transmit antenna probe transd. table
Default value: "<none>"
Function: filename of the transducer table of the transmit antenna to be used for the 3rd subrange of the scan/sweep table

Parameter: 08: 3rd range: receive antenna probe transd. table
Default value: "<none>"
Function: filename of the transducer table of the receive antenna to be used for the 3rd subrange of the scan/sweep table

Parameter: 09: 3rd range: height step size [cm]
Default value: 5
Function: stepsize for the antenna movements to be used for the 3rd subrange of the scan/sweep table

Parameter: 10: 4th range: transmit antenna probe transd. table
Default value: "<none>"
Function: filename of the transducer table of the transmit antenna to be used for the 4th subrange of the scan/sweep table

Parameter: 11: 4th range: receive antenna probe transd. table
Default value: "<none>"
Function: filename of the transducer table of the receive antenna to be used for the 4th subrange of the scan/sweep table

Parameter: 12: 4th range: height step size [cm]
Default value: 5

Function: stepsize for the antenna movements to be used for the 4th subrange of the scan/sweep table

Parameter: 13: 5th range: transmit antenna probe transd. table
Default value: "<none>"
Function: filename of the transducer table of the transmit antenna to be used for the 5th subrange of the scan/sweep table

Parameter: 14: 5th range: receive antenna probe transd. table
Default value: "<none>"
Function: filename of the transducer table of the receive antenna to be used for the 5th subrange of the scan/sweep table

Parameter: 15: 5th range: height step size [cm]
Default value: 5
Function: stepsize for the antenna movements to be used for the 5th subrange of the scan/sweep table

Topic **Graphics**

Parameter: 01: 1st graphics config., <none>: ID
Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test (absolute representation); if no filename is specified then a default name will be used

Parameter: 02: 2nd graphics config., <none>: ID + '_rel'
Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test (relative representation); if no filename is specified then a default name will be used

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"
Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID
Default value: ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value: "<none>"
Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "Probe Calibration"
Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: NSA name
Default value: "NSA ..."
Function: a string that will be taken as the description of the test object; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""
Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed

Parameter: 07: operating conditions
Default value: ""
Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Parameter: 08: test site
Default value: ""
Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed

Parameter: 09: operator
Default value: ""
Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed

Parameter: 10: test specification
Default value: ""
Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed

Parameter: 11: comment line
Default value: ""

Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

Topic **Mast**

Parameter: 01: use manual positioning only
Default value: checked
Function: if checked then manual control of the antenna mast through dialogue boxes will be used

Parameter: 02: use auto positioning only
Default value: not checked
Function: if checked then automatic control of the antenna mast will be used

Parameter: 03: symbolic name of autom. moved mast
Default value: "MAST"
Function: symbolic device name of the automatically controlled antenna mast as defined in the device configuration menu

Parameter: 04: min. height [cm] to be measured
Default value: 100
Function: defines the minimum mast height for the measurements

Parameter: 05: max. height [cm] to be measured
Default value: 400
Function: defines the maximum mast height for the measurements

Parameter: 06: speed value for movements
Default value: 5
Function: defines the speed of the mast movements:
faster for absolute positioning, slower for continuous sweeps

Topic **Polarisation**

Parameter: 01: use manual switching only
Default value: checked
Function: if checked then manual control of the antenna polarisation through dialogue boxes will be used

Parameter: 02: use auto switching only
Default value: not checked
Function: if checked then automatic control of the antenna polarisation will be used

Parameter: 03: symbolic name of autom. controlled polaris.
Default value: "MAST"
Function: symbolic device name of the automatically controlled antenna polarisation as defined in the device configuration menu

Parameter: 04: delay time [sec] for auto switching
Default value: 4

Function:	defines a waiting time with automatic switching of the antenna polarisation; the delay time depends on the mechanical system and maybe also on the weight of the antenna (the driver never gives a feedback when the switching has been completed)
Parameter:	05: measurements with horizontal polaris. only
Default value:	not checked
Function:	if checked then the all measurements will be done with horizontal polarisation only
Parameter:	06: measurements with vertical polaris. only
Default value:	checked
Function:	if checked then the all measurements will be done with vertical polarisation only

3.10 Voltage Terminal Test

3.10.1 Description

This test provides automatic measurement of conducted electromagnetic interference on the antenna terminals of TV sets, VCRs and radios.

The test starts with a preview test to look for critical frequencies while the tuner is in a "channel search mode". If there are any of them (ambient signals can optionally be cut out according to a frequency list), then the user can decide whether to continue testing with test signals. In that case (a power divider will be required and the signal loss has to be defined as a system transducer for the sweep/scan tables) the critical frequencies will be analyzed to find the corresponding channel (IF will be subtracted and a frequency list with channel width information will be used):
A message will come up to provide a test signal (channel + carrier frequency) for the (next) required channel. The oscillator frequency and all harmonic frequencies within the test range will be evaluated against the matching limit. Then these frequencies will be cut out from the spectrum and the rest will be evaluated against the limit that is defined for "other" signals. The procedure will be repeated for all critical frequencies from the preview test. In the test report for all QP measurements (if level is above the acceptance line) a note will indicate the signal type and the correseponding carrier frequency.
Without QP measurements, the list with the critical points from the preview test (PK results) will be shown in the test report.

3.10.2 Parameter Sets

Currently the following specifications are supported by the ES-K1 Standard Data:

BS 905/1

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Related Standards:	EN 55013 , CISPR 13
Test Samples:	Television Sets

EN 55013

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Related Standards:	VDE 0872 Part 13 , CISPR 13
Test Samples:	Television Sets

VDE0872/13

Frequency Range:	0.15 - 30 MHz
Detectors:	QP and AV
Related Standards:	EN 55013 , CISPR 13
Test Samples:	Television Sets

3.10.3 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "vterm_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 30
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 1000
Function: no measurements will be done above this frequency

Parameter: 04: suppress queries as far as possible
Default value: not checked
Function: if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test

Parameter: 05: split frequency range into test ranges
Default value: checked
Function: the total frequency range of the test can optionally be split into **test ranges** (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will **be completely tested** (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency, and increasing the frequency resolution with sweeps; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter 8 has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)

Parameter: 06: if splitting of frequency range: do with log. scale
Default value: checked
Function: if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale

Parameter: 07: no. of test ranges for splitting of frequency range
Default value: 1
Function: defines the number of test ranges that shall be calculated for the splitting of the frequency range

Parameter: 08: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Parameter: 09: frequency list with channel info

Default value: "<none>"
Function: defines the channel list to be used in the test, a frequency list which also holds information like channel names and channel widths

Parameter: 10: tuner IF offset in [MHz]
Default value: 0.0
Function: defines the offset that has to be subtracted from the frequencies because of the RF demodulation at a fixed IF; normally a positive value is used, but if the tuner mixes to the other direction, then add a negative sign to the value so that the offset will be added instead!

Topic **Preview**

Parameter: 01: preview result file, <none>: ID + '_pre PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 03: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Parameter: 04: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Topic **DataReduction**

Parameter: 01: all/others QP limit line
Default value "<none>"
Function: a filename that corresponds to the required QUASIPEAK limit line for the all frequencies (except fundamental and harmonic frequencies)

Parameter: 02: fundamentals QP limit line
Default value: "<none>"
Function: a filename that corresponds to the required QUASIPEAK limit line for the oscillator's fundamental frequencies

Parameter: 03: harmonics QP limit line
Default value: "<none>"
Function: a filename that corresponds to the required QUASIPEAK limit line for the oscillator's harmonic frequencies

Parameter: 04: max. no. of results kept per testrange
Default value: 6
Function: the maximum number of results that will be kept from each testrange through data reduction

Parameter: 05: decision threshold [dB] for peak reduction
Default value: 6.0
Function: determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through

Parameter: 06: level offset [dB] for acceptance analysis
Default value: -10.0
Function: determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: 07: partial scan width: no. of IF-BWs (0=use ratio)
Default value: 0
Function: determines the frequency range for partial scans expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter

Parameter: 08: partial scan width: ref. frequ. ratio
Default value: 0.01
Function: determines the frequency range for partial scans (e.g. 0.01 means ±0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Parameter: 09: frequency list of ambients to be cut out of from preview
Default value: "<none>"
Function: optional name of a frequency list (ambient interference) with frequencies to be "cut out" from measurement results (preview test: scans/sweeps, final test: partial scans), each "cut" with a range corresponding to the current IF bandwidth, e.g. +/- 60 kHz around each of the frequencies if an IF bandwidth of 120 kHz is used; to blank a modulated interference it might be necessary to provide more than one frequency in the list

Parameter: 10: cut factor for sweeps (ambients + osc. + harmonics)
Default value: 10
Function: with sweeps the width of a "cut" range has to be larger because of the lower frequency resolution of the results; therefore this factor (=number of IF bandwiths) will be used to enlarge the range compared with the range used on scan results

Topic **Final**

Parameter: 01: final QP result file, <none>: ID + '_fin QP'
Default value: "<none>"
Function: optional filename for the QUASIPEAK results from the final test; if no filename is specified then a default name will be used

Parameter: 02: final PK result file, <none>: ID + '_fin PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the final test; if no filename is specified then a default name will be used

Parameter: 03: scan table for meas. with carrier on
Default value: "<none>"
Function: filename of the scan range table to be used for the final test, when a carrier signal is present

Parameter: 04: sweep table for meas. with carrier on
Default value: "<none>"
Function: filename of the sweep range table to be used for the final test, when a carrier signal is present

Parameter: 05: scan table for partial scans + single meas.
Default value: "<none>"
Function: filename of the corresponding **scan range table** to be used for the final test, for partial scans as well as for single measurements: for single measurements with the final detector (QP/AV) the scan range table settings will be programmed and then modified if necessary (detector and measurement time); therefore the scan range table should be defined with the PEAK (and AVERAGE) detector in combination with a short measurement time, while the other settings **have to be suitable also for QUASIPEAK measurements**

Parameter: 06: perform partial scans
Default value: not checked
Function: if checked then additional partial scans will be performed around the frequencies to be analysed; in this case the final measurements will be done on those frequencies that have been found (through data reduction) with these partial scans (recommended when preview was done with sweeps or when drifting interference is to be expected)

Parameter: 07: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Parameter: 08: time [sec] for final measurements
Default value: 1.0
Function: a time that will be used for the measurements with the final detector(s); the device under test may require a minimum "duty cycle time" for full compliance testing

Parameter: 09: optional input: preview result file
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing preview result file can be specified as an input for the final test

Parameter: 10: optional input: frequency list
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing frequency list can be specified as an input for the final test

Parameter: 11: optional input: final result file
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing final result file can be specified as an input for the final test

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<keine>"

Function: optionaler Dateiname für die im Test zu verwendende Grafikkonfiguration; falls kein Dateiname spezifiziert wird, wird ein vordefinierter Name verwendet

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: markiert
Function: falls markiert wird eine Reportkonfiguration zum Drucken generiert und eine Hardcopy mit dem Gerät gestartet, das für die Software als Drucker definiert wurde

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<keine>"
Function: optionaler Dateiname für die im Test zu verwendende Reportkonfiguration zum Drucken, wenn eine Druckausgabe gewählt wird; falls kein Dateiname spezifiziert wird, wird ein vordefinierter Name verwendet

Parameter: 03: generate plotter hardcopy
Default value: nicht markiert
Function: falls markiert wird eine Reportkonfiguration zum Plotten generiert und eine Hardcopy mit dem Gerät gestartet, das für die Software als Plotter definiert wurde

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<keine>"
Function: optionaler Dateiname für die im Test zu verwendende Reportkonfiguration zum Plotten, wenn eine Plotterausgabe gewählt wird; falls kein Dateiname spezifiziert wird, wird ein vordefinierter Name verwendet

Parameter: 05: footnote, empty field: ID
Default value: ""
Function: optionaler Text für die Fußzeile auf den Seiten des Testreports; falls ein leerer String verwendet wird so wird der Test-Identifikations-String verwendet

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value "<keine>"
Function: optionaler Dateiname für den im Test zu verwendenden Reportkopf; falls kein Dateiname spezifiziert wird, wird ein vordefinierter Name verwendet

Parameter: 02: optional test report header template
Default value "<keine>"
Function: optionaler Dateiname für einen Reportkopf, der als Vorlage für den im Test zu verwendenden Reportkopf dienen soll

Parameter: 03: 1st header line
Default value: "TEST"
Function: Zeichenkette, die im Reportkopf als erste Kopfzeile übernommen werden soll; falls nichts angegeben wird, so bleibt die entsprechende Zeile unverändert

Parameter: 04: 2nd header line
Default value: "Voltage Terminal Test"
Function: Zeichenkette, die im Reportkopf als zweite Kopfzeile übernommen werden soll; falls nichts angegeben wird, so bleibt die entsprechende Zeile unverändert

Parameter: 05: E.u.T. name
Default value: "E.u.T."

Function: Zeichenkette, die im Reportkopf als Beschreibung des Testobjektes übernommen werden soll; falls nichts angegeben wird, so bleibt die entsprechende Zeile unverändert

Parameter: 06: manufacturer
Default value: ""
Function: Zeichenkette, die im Reportkopf als Beschreibung Herstellers (des Testobjektes) übernommen werden soll; falls nichts angegeben wird, so bleibt die entsprechende Zeile unverändert

Parameter: 07: operating conditions
Default value: ""
Function: Zeichenkette, die im Reportkopf als Beschreibung der Testbedingungen übernommen werden soll; falls nichts angegeben wird, so bleibt die entsprechende Zeile unverändert

Parameter: 08: test site
Default value: ""
Function: Zeichenkette, die im Reportkopf als Beschreibung des Testortes übernommen werden soll; falls nichts angegeben wird, so bleibt die entsprechende Zeile unverändert

Parameter: 09: operator
Default value: ""
Function: Zeichenkette, die im Reportkopf als Beschreibung des Testers übernommen werden soll; falls nichts angegeben wird, so bleibt die entsprechende Zeile unverändert

Parameter: 10: test specification
Default value: ""
Function: Zeichenkette, die im Reportkopf als Beschreibung der Testspezifikation übernommen werden soll; falls nichts angegeben wird, so bleibt die entsprechende Zeile unverändert

Parameter: 11: comment line
Default value: ""
Function: Zeichenkette, die im Reportkopf als Kommentarzeile übernommen werden soll; falls nichts angegeben wird, so bleibt die entsprechende Zeile unverändert

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
Function: Zeichenkette, die im Reportkopf als Kommentarzeile übernommen werden soll; falls ein leerer String verwendet wird so wird die Startzeit des Tests eingetragen

3.11 Azimuth Chart Test

3.11.1 Description

With this test the radiation pattern of an E.u.T. as well as the azimuth pattern of an antenna can be measured and be displayed in a polar chart.
For gaining the radiation pattern of an E.u.T., the device has to be mounted onto a turntable.
The azimuth pattern of an antenna can be retrieved by turning the (receiving) antenna (optionally with a turntable) while transmitting antenna - e.g. mounted on a tripod - radiates with a constant level (provided by the tracking generator of the receiver). Maximum eight frequencies will be measured with each azimuth step. The measured levels will be stored along with the azimuths an displayed in a polar diagram (level against azimuth; one curve per frequency). The display of the levels may be either absolute or relative to the levels of the main azimuth (an offset can be defined); the levels of the main azimuth can be stored as a reference so that with another test they can be used for a relative display.

3.11.2 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "chart_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: frequ. list for single measurements
Default value: "CAL"
Function: frequency with the frequencies to be measured; only the first eight frequencies within the given and available frequency range will be used

Parameter: 03: global start frequency [MHz] for the test
Default value: 30
Function: no measurements will be done below this frequency

Parameter: 04: global stop frequency [MHz] for the test
Default value: 1000
Function: no measurements will be done above this frequency

Parameter: 05: main azimuth [deg] (used as azimuth offset)
Default value: 0
Function: defines the main azimuth; the value will be used as an offset for the results

Parameter: 06: relative display
Default value: not checked
Function: if checked then the levels will be calculated relatively either to the main azimuth or to the loaded reference

Parameter: 07: name of reference results to be used
Default value: ""
Function: name of the reference file (stored as a transducer) which shall be used for the relative display of the levels

Parameter: 08: name of reference results to be stored
Default value: ""
Function: name of the reference file which holds the levels of the main azimuth (will be stored as a transducer)

Parameter: 09: test configuration, <none>: ID
Default value: "<keine>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Measurement**

Parameter: 01: scan table for single measurements
Default value: "<none>"
Function: filename of the scan range table to be used for the (single) measurements

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID

Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"
Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID
Default value: ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value: "<none>"
Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "Azimuth Chart"
Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: E.u.T. name
Default value: "E.u.T."

Function: a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""
Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed

Parameter: 07: operating conditions
Default value: ""
Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Parameter: 08: test site
Default value: ""
Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed

Parameter: 09: operator
Default value: ""
Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed

Parameter: 10: test specification
Default value: ""
Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed

Parameter: 11: comment line
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

Topic **Turntable**

Parameter: 01: use manual positioning only
Default value: checked
Function: if checked then manual control of the turntable through dialogue boxes will be used

Parameter: 02: use auto positioning only
Default value: not checked
Function: if checked then automatic control of the turntable will be used

Parameter: 03: symbolic name of autom. moved turntable
Default value: "TURNTABLE"
Function: symbolic device name of the automatically controlled turntable as defined in the device configuration menu

Parameter: 04: min. azimuth [deg]
Default value: 0

Function: defines the minimum azimuth for the measurements

Parameter: 05: max. azimuth [deg]
Default value: 360
Function: defines the maximum azimuth for the measurements

Parameter: 06: azimuth stepsize [deg] for finals
Default value: 45
Function: defines the stepsize for the azimuth variation

Parameter: 07: speed value for faster movements
Default value: 6
Function: determines the speed of the automatically moved turntable

3.12 Overview Test

3.12.1 Description

This test consists of a preview test (scan or sweep) as well as an automatic and/or a manual data reduction (for finding critical frequencies).
The automatic data reduction works as with other standard scripts.
With the manual data reduction the user can select suspect frequencies with the marker from the spectrum of the preview test and add these to a list. In addition, either a partial scan or a partial sweep can be run around these frequencies, thus improving the accuracy of the frequencies.
It is a good idea to define the scan/sweep table such that a continuous repetition will occur. If any accessory dialogs (e.g. for a LISN or an automatic antenna mast) then these devices can be controlled al over the test, i.e. the user himself does the maximization through varying of the accessories.

3.12.2 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "ovw_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 30
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 1000
Function: no measurements will be done above this frequency

Parameter: 04: suppress queries as far as possible
Default value: not checked
Function: if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test

Parameter: 05: split frequency range into test ranges
Default value: checked
Function: the total frequency range of the test can optionally be split into **test ranges** (linear or logarithmic, with respect to the ranges of the scan/sweep range table) that are calculated by the script and will **be completely tested** (preview test, data reduction, final test), therefore reducing the time elapsed between preview and final test, which is very useful with interference drifting over frequency, and increasing the frequency resolution with sweeps; besides, this method reduces manual interaction, if more than one probe transducer has to be used for the test (e.g. two antennas for 30 - 1000 MHz in a field strength test); the value given with parameter 8 has to be interpreted as a minimum value; if the value is set to (typically) 1 then nevertheless for each subrange of the scan/sweep table which used for the preview test, a test range will be calculated (e.g. a field strength test with two antennas or scan/sweep ranges will lead to one test range each); if splitting is not used then the whole frequency range of the scan/sweep table will be tested as one single test range (but maybe with a number of messageboxes requiring to change the antenna !)

Parameter: 06: if splitting of frequency range: do with log. scale
Default value: checked
Function: if checked then the splitting of the frequency range (if activated) will lead to test ranges of equal width in the logarithmic scale, else in the linear scale

Parameter: 07: no. of test ranges for splitting of frequency range
Default value: 1
Function: defines the number of test ranges that shall be calculated for the splitting of the frequency range

Parameter: 08: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Preview**

Parameter: 01: preview result file, <none>: ID + '_pre PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the preview test; if no filename is specified then a default name will be used

Parameter: 02: 2nd preview result file, <none>: ID + '_pre AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the preview test; if no filename is specified then a default name will be used

Parameter: 03: scan table for preview
Default value: "<none>"
Function: filename of the scan range table to be used for the preview test

Parameter: 04: sweep table for preview
Default value: "<none>"
Function: filename of the sweep range table to be used for the preview test

Parameter: 05: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the preview test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Parameter: 06: optional input: preview result file
Default value: "<none>"
Function: if the test shall be performed without a preview test then an existing preview result file can be specified as an input for the data reduction, one (for PK+AV results) or optionally two (1st for PK, 2nd for AV) input files

Parameter: 07: optional input: preview result file (2nd det.)
Default value: "<none>"
Function: see previous parameter

Topic **DataReduction**

Parameter: 01: perform manual (interactive) data reduction
Default value: not checked
Function: if checked then an automatic data reduction will be performed; if the next parameter is also activated then the manual data reduction will be done after the automatic one

Parameter: 02: perform automatic data reduction
Default value: not checked
Function: if checked then a manual data reduction will be performed; if the previous parameter is also activated then the manual data reduction will be done after the automatic one

Parameter: 03: QP limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the QUASIPEAK detector

Parameter: 04: optional QP acceptance line (no offset)
Default value: "<none>"

Function: a filename of an optional limit line which will be directly used as a quasi arbitrarily defined acceptance line for the acceptance analysis during data reduction of PEAK results; if used then the given value for the acceptance offset will be ignored

Parameter: 05: optional AV limit line
Default value: "<none>"
Function: a filename that corresponds to the required limit line for the AVERAGE detector

Parameter: 06: optional AV acceptance line (no offset)
Default value: "<none>"
Function: a filename of an optional limit line which will be directly used as a quasi arbitrarily defined acceptance line for the acceptance analysis during data reduction of AVERAGE results; if used then the given value for the acceptance offset will be ignored

Parameter: 07: max. no. of results kept per test range
Default value: 6
Function: the maximum number of results that will be kept from each test range through data reduction

Parameter: 08: decision threshold [dB] for peak reduction
Default value: 6.0
Function: determines the decision level when data reduction is done with the "Peak Reduction"; a higher (stricter) value means that less peaks will be detected in the spectrum so that more results from the subrange maxima reduction will come through

Parameter: 09: level offset [dB] for acceptance analysis
Default value: -10.0
Function: determines the level offset when data reduction is done with the "Acceptance Analysis"

Parameter: 10: freq. list of ambients to be cut out from preview
Default value: "<none>"
Function: optional name of a frequency list (ambient interference) with frequencies to be "cut out" from measurement results (preview test: scans/sweeps, final test: partial scans), each "cut" with a range corresponding to the current IF bandwidth, e.g. +/- 60 kHz around each of the frequencies if an IF bandwidth of 120 kHz is used; to blank a modulated interference it might be necessary to provide more than one frequency in the list

Parameter: 11: cutting width for sweeps (ambients): no. of IF-BWs
Default value: 10
Function: with sweeps the width of a "cut" range (see previous parameter) has to be larger because of the lower frequency resolution of the results; therefore this factor (=number of IF bandwiths) will be used to enlarge the range compared with the range used on scan results

Topic **Monitor**

Parameter: 01: scan table for preview
Default value: "<keine>"
Default value: "<none>"
Function: filename of the scan table to be used for partial scans; this parameter cannot be used together with the next parameter

Parameter: 02: sweep table for preview
Default value: "<keine>"
Function: filename of the sweep table to be used for partial sweeps; this parameter cannot be used together with the previous parameter

Parameter: 03: partial scan/sweep width: no. of IF-BWs (0=use ratio)
Default value: 0
Function: determines the frequency range for partial scans/sweeps expressed in multiples of the IF bandwidth used in the referring scan/sweep table; if the value is set to 0 then the calculation of the partial scan width is based on the following parameter

Parameter: 04: partial scan/sweep width: ref. frequ. ratio
Default value: 0.01
Function: determines the frequency range for partial scans/sweeps (e.g. 0.01 means ±0.5 %) in reference to the given mid frequency; the parameter is effective only if the previous parameter is set to 0

Topic **Final**

Parameter: 01: final result file, <none>: ID + '_fin PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the data reduction; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin AV'
Default value: "<none>"
Function: optional filename for the AVERAGE results from the data reduction; if no filename is specified then a default name will be used

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"

Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID
Default value: ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value: "<none>"
Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "Overview"
Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: E.u.T. name
Default value: "E.u.T."
Function: a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""
Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed

Parameter: 07: operating conditions
Default value: ""
Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Parameter: 08: test site
Default value: ""
Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed

Parameter: 09: operator
Default value: ""
Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed

Parameter: 10: test specification

Default value: ""
Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed

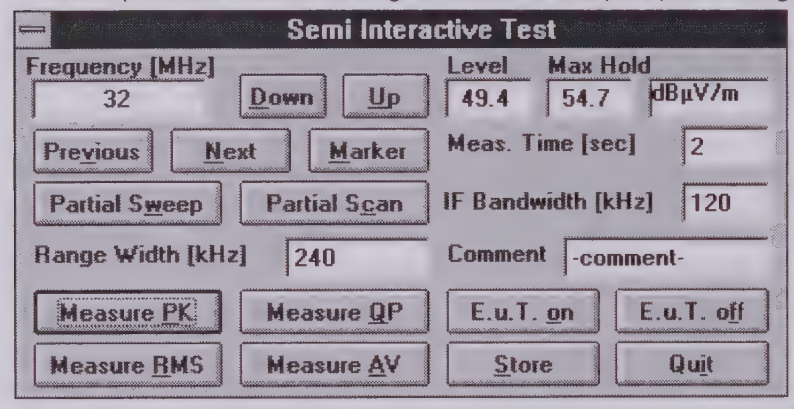
Parameter: 11: comment line
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

3.13 Semi Interactive Test

3.13.1 Description

An open area test site (OATS)is normally not suitable for automatic tests because of the many ambient disturbances. In this case the operator has to find out (e.g. through switching the E.u.T. off and on if possible or by looking at / listening to the signal) whether the field strength generated by the E.u.T. is above the limit, but sometimes this can be impossible, when the ambient disturbance exceeds the limit. This test provides interactive single measurements plus protocolling, controlled from a special dialog:



By clicking **Down** and **Up** the arbitrarily editable frequency will be decreased and increased by the step size defined in the scan table. If the test is based on a frequency list or on a measurement result list then with **Previous** and **Next** the dialogue will switch to the corresponding frequency. With measurement results the referring positions of the antenna and the E.u.T. can optionally be set. A click on the button **Marker** will copy the marker frequency of the currently active graphics diagram (if it has the marker activated).

The buttons **Partial Sweep** and **Partial Scan** start measurements to watch the spectrum around the current frequency if suitable range tables are selected with the script parameters. If those range tables are defined with continous repetitions then also variations in the spectrum can be observed (e.g. while moving the antenna). The resulting curve(s) will be shown in an extra window with the marker activated so that the maximum of the curve can easily be retrieved. The width of the partial scan or sweep can be defined in the field 'Range Width'.

Through activating one of the measurement detectors (**Measure Peak / Quasipeak / RMS / Average**) a single measurement will be started, using the given values for measurement time ('Meas.Time' in seconds) and for IF filter bandwidth ('IF Bandwidth' in kHz). The level will be displayed both digitally in the dialogue (current and maximum value) and as an analog bar. The analog bar display which can also be seen from a distance will adapt ist "operating range" to the current level value. As soon as the maximum has been found, the result (the maximum level) along with a short text ('Comment') can be saved by pressing **Store**. For each of the detectors there will be one measurement result file which also holds information about the limit and optionally about the settings of mast and turntable.

If the E.u.T. can be remotely switched then by pressing **E.u.T. on** and **E.u.T. off** a line of the parallel port (device driver LPT I/O) can be used as a TTL control signal; this feature enhances the identification of interference signals on an OATS.

3.13.2 List of the Script Parameters

Topic **Test**

Parameter: 01: ID max. 12 chars to be included in filenames
Default value: "semi_0001"
Function: a short string that will be used for building up various default strings (see below); this string enables easy identification of files that belong to the same test

Parameter: 02: global start frequency [MHz] for the test
Default value: 30
Function: no measurements will be done below this frequency

Parameter: 03: global stop frequency [MHz] for the test
Default value: 1000
Function: no measurements will be done above this frequency

Parameter: 04: suppress queries as far as possible
Default value: not checked
Function: if not checked then additional queries will come up that help to avoid overwriting of files or to skip certain parts of the test

Parameter: 05: frequency list to be used (if next param is NONE)
Default value: "<keine>"
Function: optional name of a frequency list with frequencies on which the test shall be based; the list might hold critical frequencies that have been entered manually or have been the output of a data reduction; this frequency list won't be used if a measurement result list is selected with the next parameter

Parameter: 06: measurement result to be used
Default value: "<keine>"
Function: optional name of a measurement result list with frequencies on which the test shall be based; the list might hold results that have been the output of a data reduction or of an automatic test; if this result list also holds information (columns) about mast and turntable settings, then parameter *Final 11* will make the script use these data for positioning mast and turntable accordingly

Parameter: 07: test configuration, <none>: ID
Default value: "<none>"
Function: optional filename of the test configuration (lists all files belonging to the test, for easy transfers through Export/Import/Move) to be created by the test; if no filename is specified then a default name will be used

Topic **Final**

Parameter: 01: final result file, <none>: ID + '_fin PK'
Default value: "<none>"
Function: optional filename for the PEAK results from the data reduction; if no filename is specified then a default name will be used

Parameter: 02: 2nd final result file, <none>: ID + '_fin QP'
Default value: "<none>"
Function: optional filename for the QUASIPEAK results from the data reduction; if no filename is specified then a default name will be used

Parameter: 03: 3rd final result file, <none>: ID + '_fin AV'

Default value: "<none>"
Function: optional filename for the AVERAGE results from the data reduction; if no filename is specified then a default name will be used

Parameter: 04: 4th final result file, <none>: ID + '_fin RMS'
Default value: "<none>"
Function: optional filename for the RMS results from the data reduction; if no filename is specified then a default name will be used

Parameter: 05: scan table for single measurements
Default value: "<keine>"
Function: filename of the scan range table to be used for single measurements; the settings will be loaded and then modified according to the settings of the dialogue (detector, IF bandwidth and measurement time)

Parameter: 06: scan table for partial scans
Default value: "<keine>"
Function: filename of the scan range table to be used for partial scans; to observe the spectrum more easily it is recommended to define a scan table with continuous repetitions

Parameter: 07: sweep table for partial sweeps
Default value: "<keine>"
Function: filename of the sweep range table to be used for partial sweeps; to observe the spectrum more easily it is recommended to define a sweep table with continuous repetitions

Parameter: 08: insert results into existing result file
Default value: not checked
Function: if not checked then any existing result files with a filename identical to the filename used in the final test will be deleted/overwritten; else: any existing result files will only partly be overwritten (within the specified frequency range): therefore it is possible to **remeasure certain bands of the spectrum** while keeping the rest unchanged

Parameter: 09: use/store field mast/turntable data if available
Default value: not checked
Function: if checked then any information about mast/turntable positions will be used (measurement result list as a basis for the test, see parameter Test 06); those positions will be directly set each time when a frequency is selected (previous or next); besides, the current positions will be stored in the result files of the test

Topic **Limits**

Parameter: 01: optional PK limit line
Default value: "<none>"
Function: a filename that corresponds to an optional limit line for the PEAK detector; if selected then the result file that corresponds to the detector will also show the values of the limit and the margin

Parameter: 02: optional QP limit line
Default value: "<none>"
Function: a filename that corresponds to an optional limit line for the QUASIPEAK detector; if selected then the result file that corresponds to the detector will also show the values of the limit and the margin

Parameter: 03: optional AV limit line

Default value: "<none>"
Function: a filename that corresponds to an optional limit line for the AVERAGE detector; if selected then the result file that corresponds to the detector will also show the values of the limit and the margin

Parameter: 04: optional RMS limit line
Default value: "<none>"
Function: a filename that corresponds to an optional limit line for the RMS detector; if selected then the result file that corresponds to the detector will also show the values of the limit and the margin

Topic **Graphics**

Parameter: 01: graphics configuration, <none>: ID
Default value: "<none>"
Function: optional filename for the graphics configuration to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: range of the analog level bar display [dBxx]
Default value: 40
Function: defines the display range of the analogue level display; as soon as the level comes closer than 5 dB to one end of the display range then the range will be shifted accordingly by 10 dB

Topic **Report**

Parameter: 01: generate printer hardcopy
Default value: checked
Function: if checked then a report configuration for printing will be generated and a hardcopy will be sent to the device which is defined as the printer for the software

Parameter: 02: report config. for printing, <none>: ID + '_prnt'
Default value: "<none>"
Function: optional filename for the report configuration for printing, if printer output is selected; if no filename is specified then a default name will be used

Parameter: 03: generate plotter hardcopy
Default value: not checked
Function: if checked then a report configuration for plotting will be generated and a hardcopy will be sent to the device which is defined as the plotter for the software

Parameter: 04: of report config. for plotting, <none>: ID + '_plot'
Default value: "<none>"
Function: optional filename for the report configuration for plotting, if plotter output is selected; if no filename is specified then a default name will be used

Parameter: 05: footnote, empty field: ID
Default value: ""
Funktion: optional text as a footnote on the pages of the test report; if an empty string is used then the ID string of the test will be used

Topic **ReportHeader**

Parameter: 01: test report header, <none>: ID
Default value: "<none>"

Function: optional filename for the report header to be used in the test; if no filename is specified then a default name will be used

Parameter: 02: optional test report header template, <none>: ID
Default value: "<none>"
Function: optional filename of a report header which shall be taken as a template for the one to be used in the test; if no filename is specified then a default name will be used

Parameter: 03: 1st header line
Default value: "TEST"
Function: a string that will be taken as the first header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 04: 2nd header line
Default value: "Semi Interactive Test"
Function: a string that will be taken as the second header line; if no string is given then the referring entry of the report header won't be changed

Parameter: 05: E.u.T. name
Default value: "E.u.T."
Function: a string that will be taken as the description of the equipment under test; if no string is given then the referring entry of the report header won't be changed

Parameter: 06: manufacturer
Default value: ""
Function: a string that will be taken as the name of the manufacturer (of the E.u.T.); if no string is given then the referring entry of the report header won't be changed

Parameter: 07: operating conditions
Default value: ""
Function: a string that will be taken as the description of the conditions of the test; if no string is given then the referring entry of the report header won't be changed

Parameter: 08: test site
Default value: ""
Function: a string that will be taken as the description of the test site; if no string is given then the referring entry of the report header won't be changed

Parameter: 09: operator
Default value: ""
Function: a string that will be taken as the description of the operator; if no string is given then the referring entry of the report header won't be changed

Parameter: 10: test specification
Default value: ""
Function: a string that will be taken as the description of the test specification; if no string is given then the referring entry of the report header won't be changed

Parameter: 11: comment line
Default value: ""
Function: a string that will be taken as a comment line ; if no string is given then the referring entry of the report header won't be changed

Parameter: 12: 2nd comment line (empty field: start time)
Default value: ""

Function: a string that will be taken as a comment line ; if no string is given then the start time of the test will be entered

Topic **SwitchEUT**

Parameter: 01: symbolic name of autom. EuT switch
Default value: "LPTIO"
Function: symbolic device name of the CENTRONICS parallel I/O interface driver as defined in the device configuration menu; one output line will be used as a TTL control line

Parameter: 02: LPT I/O output pin no. (1-9)
Default value: 2
Function: defines an output line (connector pin no. 1 - 9) of the parallel port as the control line for automatic switching of the E.u.T.

Topic **Mast**

Parameter: 01: use manual positioning only
Default value: checked
Function: if checked then manual control of the antenna mast through dialogue boxes will be used

Parameter: 02: use auto positioning only
Default value: not checked
Function: if checked then automatic control of the antenna mast will be used

Parameter: 03: symbolic name of autom. moved mast
Default value: "MAST"
Function: symbolic device name of the automatically controlled antenna mast as defined in the device configuration menu

Parameter: 04: speed value for movements
Default value: 6
Function: determines the speed of the automatically moved mast

Topic **Turntable**

Parameter: 01: use manual positioning only
Default value: checked
Function: if checked then manual control of the turntable through dialogue boxes will be used

Parameter: 02: use auto positioning only
Default value: not checked
Function: if checked then automatic control of the turntable will be used

Parameter: 03: symbolic name of autom. moved turntable
Default value: "TURNTABLE"
Function: symbolic device name of the automatically controlled turntable as defined in the device configuration menu

Parameter: 04: speed value for faster movements
Default value: 6
Function: determines the speed of the automatically moved turntable

Topic **Polarisation**

Parameter:	01: use manual switching only
Default value:	checked
Function:	if checked then manual control of the antenna polarisation through dialogue boxes will be used

Parameter:	02: use auto switching only
Default value:	not checked
Function:	if checked then automatic control of the antenna polarisation will be used

Parameter:	03: symbolic name of autom. controlled polaris.
Default value:	"MAST"
Function:	symbolic device name of the automatically controlled antenna polarisation as defined in the device configuration menu

Parameter:	04: delay time [sec] for auto switching
Default value:	4
Function:	defines a waiting time with automatic switching of the antenna polarisation; the delay time depends on the mechanical system and maybe also on the weight of the antenna (the driver never gives a feedback when the switching has been completed)

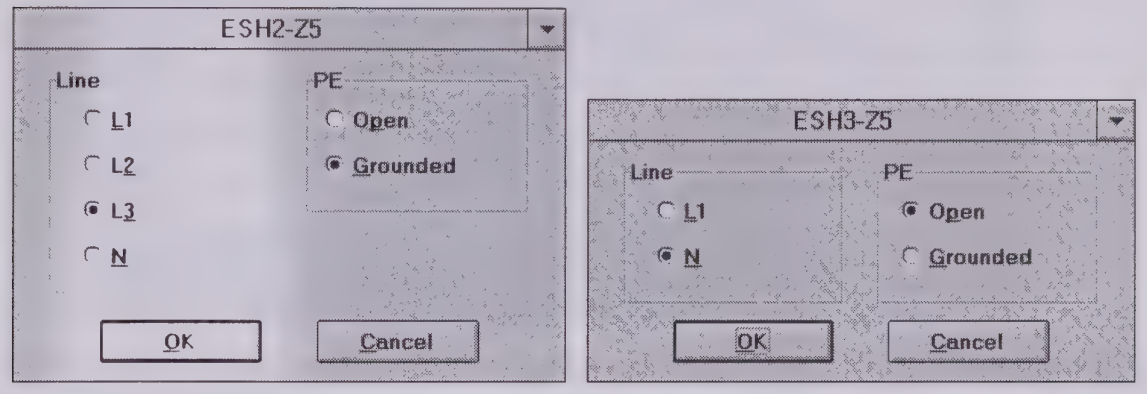
4 Standard Device Drivers

4.1 V Networks ESH2-Z5 and ESH3-Z5

The drivers provide all functions that are necessary for controlling the artificial mains networks ESH2-Z5 (four line V-network) and ESH3-Z5 (two line V-network) from Rohde&Schwarz.

4.1.1 Interactive Mode

With the selection of **ESH2-Z5...** or **ESH3-Z5...** in the menu **Test - Set device** the corresponding dialogue comes up:



One of the provided lines (live, neutral) can be chosen. In addition the protective earth can be set to be either open (floating) or grounded.

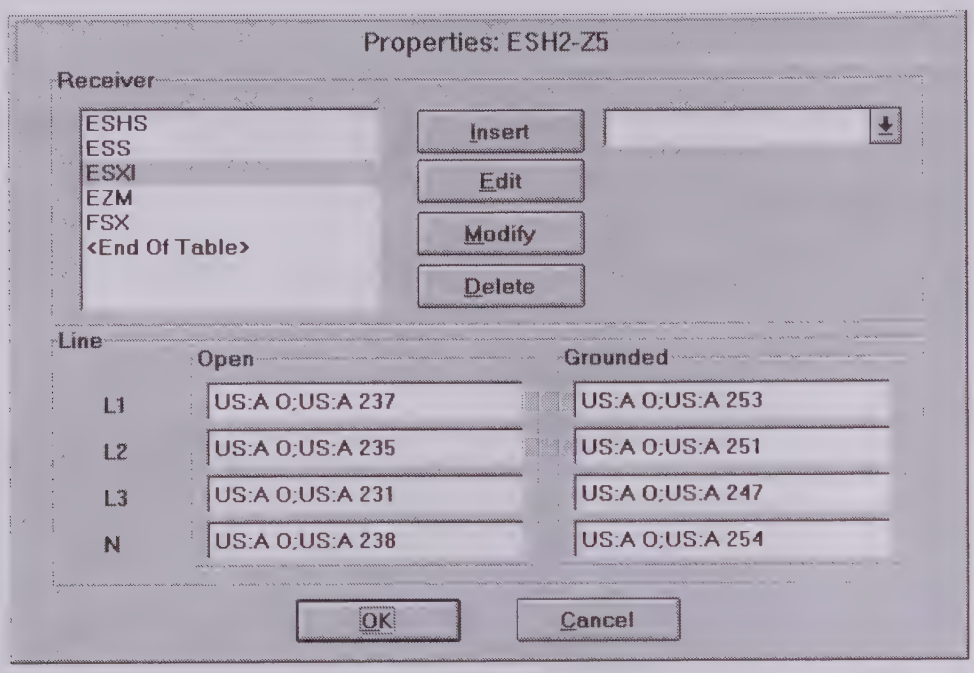
4.1.2 Script Mode

In the script mode the settings of the artificial mains network are done by means of the commands set_device(...) and get_device(...). A detailed description is given in chapter 5.2 of the "script development kit".

Setup of the line to be tested
Command LISN_PHASE
Parameter "N", "P1"
"P2", "P3" (ESH2-Z5 only)
Setup of the PE (floating / grounded)
Command LISN_PE
Parameter "FLO", "GND"

4.1.3 IEEE Bus Commands

The IEEE bus commands for remote control are dependant on the instrument to which the artificial mains network is connected to. The control works via the user port of that instrument.
The settings have to be done in the dialogue Properties in the menu Device configuration with respect to the referring instrument.



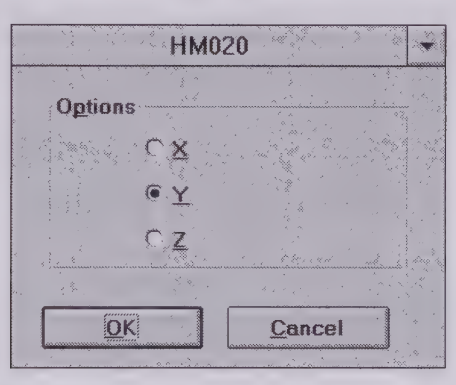
With the installation of an option ES-K1x all necessary commands are already provided (files *S_NN2.INI* for ESH2-Z5, *S_NN3.INI* for ESH3-Z5).
Through double clicking of a certain receiver all IEEE bus commands that are suited to control the user port will be displayes in the corresponding fields. Receivers that are not used might be deleted from the list (the commands for those receivers will also be deleted!), and only "active" receivers can be inserted into the list.
The commands can be arbitrarily edited (max. 50 characters) so that the driver could also be used for other purposes, e.g. for switching - via the user port - of a device under test.

4.2 Triple Loop Antenna HM020

The drivers provide all functions that are necessary for controlling the triple loop antenna HM020 from Rohde&Schwarz.

4.2.1 Interactive Mode

With the selection of **HM020...** in the menu **Test - Set device** the corresponding dialogue comes up:



One of the three loops can be selected.

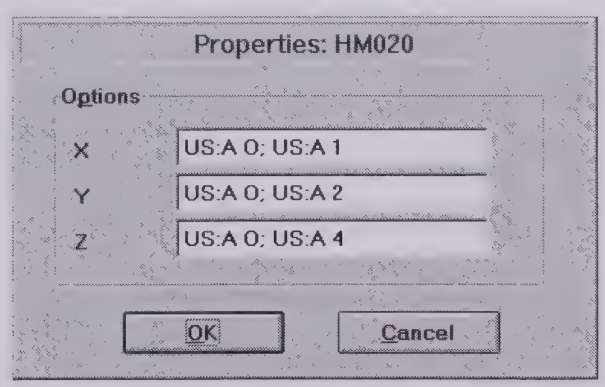
4.2.2 Script Mode

In the script mode the settings of the triple loop antenna are done by means of the commands set_device(...) and get_device(...). A detailed description is given in chapter 5.2 of the "script development kit".

Setup of the loop to be tested
Command: LOOP
Parameter: "X", "Y", "Z"

4.2.3 IEEE Bus Commands

The IEEE bus commands for remote control are dependant on the instrument to which the artificial mains network is connected to. The control works via the user port of that instrument.
The settings have to be done in the dialogue Properties in the menu Device configuration with respect to the referring instrument.



With the installation of an option ES-K1x all necessary commands are already provided (file *SH_HM020.INI*) but depending on the cable to be used, other settings might be required (chech with volt meter).

The commands can be arbitrarily edited (max. 50 characters) so that the driver could also be used for other purposes, e.g. for switching - via the user port - of a device under test.

4.3 Relay Matrix RSU/PSU

The drivers provide all functions that are necessary for controlling the relay matrix devices RSU and PSU from Rohde&Schwarz. The RSU is identical to the PSU except the electrical specifications of the RF relays.

4.3.1 Concept

The software can control up to four RSU units. These units can be used separately as well as combined. For a combined usage there's an extra driver SUPER-RSU that is not associated to any interface but can address any of the installed RSU drivers. Therefore the SUPER-RSU driver is a means to handle a set of RSU drivers, e.g.:

SUPER-RSU => {RSU1}

or

SUPER-RSU => {RSU1 + RSU2 + RSU3 + RSU4}

Automatic switching of one or more RSUs during sweeps/scans (change of antennas or receivers) is possible only through making use of the SUPER-RSU driver; here additional system transducers should be defined to take respect of the signal loss through the relay cabling. For all other puposes it is sufficient to use of the RSU driver(s) only.

4.3.2 Setup of the RSU Drivers

To get the drivers into the device list, one has to go into the device configuration, press the **Load** button and then go into the selection box 'Device'.
Select the RSU, edit the name (e.g. RSU1 if you want to use more than one RSU) and the GPIB address, then add the device to the list.
Repeat this for all (max. 4) RSUs you want to install.
If needed, also select the SUPER-RSU and add it to the device list now.

Now the relay switch definitions have to be made:
For each RSU driver go to the **Properties...** and define switching paths ('Signal Path') and the corresponding commands, e.g.:
for *RSU1* (path name / command):

'Path X'	*'S1 R2'*	(set relay 1; reset relay 2)
'Path Y'	*'R1 R2'*	(reset relay 1; reset relay 2)
'Path Z'	*'R1 S2'*	(reset relay 1; set relay 2)

for *RSU2* (path name / command):

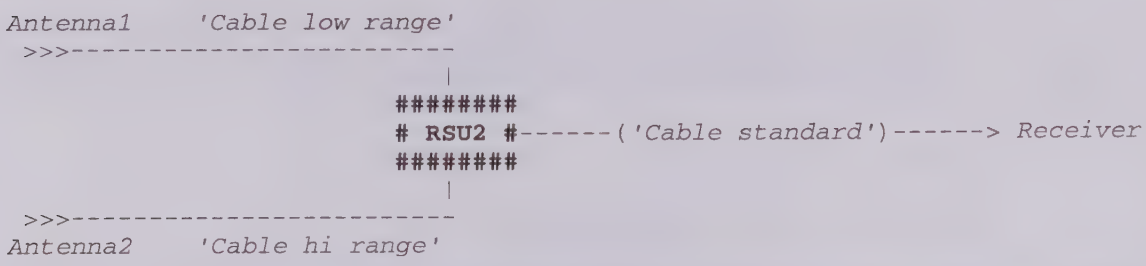
'Path Left'	*'S3 S4'*	(set relay 3; set relay 4)
'Path Right'	*'R3 R4'*	(reset relay 3; reset relay 4)

Now leave the dialogs and test all path definitions through the interactive dialog(s) for the relay matrix:
'Test' => 'Set device...' => 'RSU1'
Select a path and press **Switch**. Check the relay settings through the RSU's front panel LEDs.

4.3.3 Setup of the SUPER-RSU Driver

Before you define any settings for the SUPER-RSU you should first define system transducers for the cables you're using, e.g. *'Cable low range'* and *'Cable hi range'*.

Now look at the following example:
You want to use relay 3 of RSU2 to switch automatically between Antenna1 and Antenna2 during scans/sweeps.



You have to go into the **Properties...** dialog (Device Configuration). Define a global 'Signal Path Name' and associate the refering RSUx paths (select and add), along with the corresponding system transducer (cable loss), e.g.:

Antenna1
RSU2: 'Path Left'
(RSUx: '...')
System Transducer: *'Cable low range'*
Antenna2
RSU2: 'Path Left'
(RSUx: '...')
System Transducer: *'Cable hi range'*

Now when you create or edit any scan/sweep range table, select the required 'Signal Path' for each range, e.g.:
0 - 300 MHz
Antenna1 (text 'Cable low range' will appear)
300 - 1000 MHz
Antenna2 (text 'Cable hi range' will appear)
Any cables that belong to both signal paths can be added as "Additional Transducers".

4.3.4 Script Mode

In the script mode the settings of the RSU devices are done by means of the commands set_device(...) and get_device(...). A detailed description is given in chapter 5.2 of the "script development kit".

4.4 Driver LPT I/O

4.4.1 Overview

The driver LPT I/O provides all functions that are necessary for controlling a parallel port of the PC. The driver can be used for simple monitoring and controlling purposes.

4.4.2 Hardware

The parallel port can be used as a controlling/monitoring interface, i.e., the lines of the interface can separately be set as output lines or be read as input lines. Setting and reading of the lines will occur only when the driver is being told to do so, not permanently in the background.

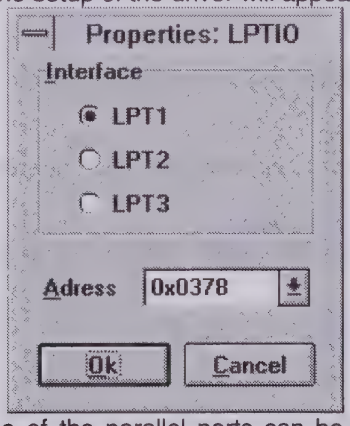
The driver LPT I/O makes use of the following signals (pin no. in brackets):
Reading: /ERROR (Pin # 15), SLCT (# 13), PE (# 12), /ACK (#10), /BUSY (# 11)
Writing: D0 - D7 (# 2-9), /STROBE (# 1), AUTO FEED (# 14), /INIT (# 16), SLCT IN (# 17)

The hardware control registers will be directly accessed.

A more detailed description of the PC's parallel port can be found in various publications.

4.4.3 Properties

Through selecting of the LPT I/O driver in the **device configuration** and clicking onto the button **Properties**, the following dialog for the setup of the driver will appear:



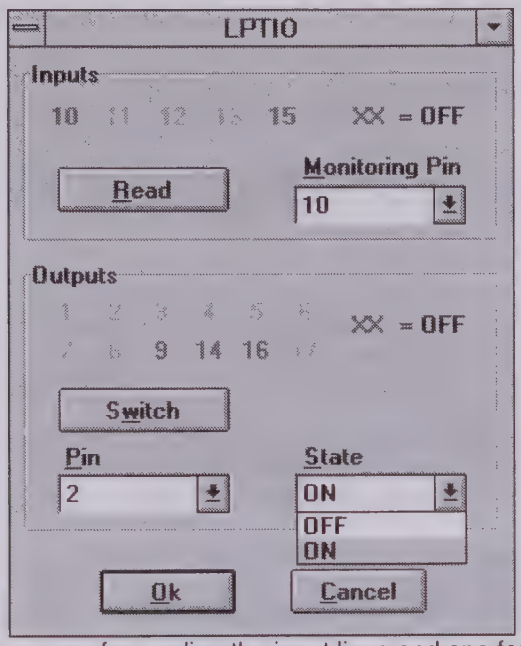
In the upper area of the dialog, one of the parallel ports can be selected as an **interface** (normally there's no problem if the hardlock is attached to the same interface port). With the field **Address** the base I/O address of the port can be selected. If the address is not known then e.g. start the diagnostics program *MSD.EXE* and look for the LPT ports.

Parameter: **Interface**
Function: selection of the parallel port
Value range: LPT1, LPT2, LPT3.

Parameter: **Address**
Function: selection of the base I/O address
Value range: 03BChex, 0378hex, 0278hex

4.4.4 Dialog mode

When selecting the LPT I/O driver in the **Test** -> **Set device...** then the referring dialog comes up:



The dialog consists of two areas, one for reading the input lines and one for setting the output lines. The numbers refer to the hardware pins of the parallel port.

Display: current states of the **inputs**
Function: Display of the input line states. The state of each line is represented by ist colour.

Button: **Read**
Function: Reads and displays the the states of all input lines

Parameter: **Monitoring Pin**
Function: Selects the input line to be read (redundant functionality).

Display: current states of the **outputs**
Function: Display of the output line states. The state of each line is represented by ist colour.

Parameter: **Pin**
Function: Selects the output line to be switched.

Parameter: **State**
Function: Selects the state of the line selected with **Pin**.
Value range: ON, OFF

Button: **Switch**
Function: Switches the selected line to the selected state and updates the display of the output lines.

4.4.5 Script Commands

Syntax of the script commands:

```
INTEGER get_device (STRING device, INTEGER cmnd, VOID param,
                    VAR INTEGER device_err_no, VAR STRING device_err_txt)
INTEGER set_device (STRING device, INTEGER cmnd, VOID param,
                    VAR INTEGER device_err_no, VAR STRING device_err_txt)
```

Parameter: description of the operation
Data type: description of the data type of the referring data

Transfer: Internal means, the data will be transferred to or from the software driver only.
External means, the command directly affects the device.
The information about the state of a pin ("high" or "low") is done by a character "S" (Set) or "R" (Reset) in the data string of the script function call.

ICS_OUT

Usage: get_device, set_device
Parameter: *set_device:* state of a single output line to be switched
get_device: state of a single output line (selected by ICS_INDEX)
Data type: STRING
Transfer: external
Note: *set_device:* "S16" means pin 16 will be set (to "high")
get_device: gives the state of a single output line (selected by ICS_INDEX)
syntax: e.g. "S12", "R1".

ICS_IN

Usage: get_device
Parameter: state of a single input line (selected by ICS_INDEX)
Data type: STRING
Transfer: external
Note: syntax z.B. "S10", "R15".

ICS_INDEX

Usage: get_device, set_device
Parameter: pin index
Data type: INTEGER
Transfer: internal
Note: value range 1, ..., 17.

5 Dynamic Data Exchange (DDE)

5.1 General

DDE (Dynamic Data Exchange) enables to dynamically exchange data between two Windows applications, provided both applications support the DDE functionality of Windows.
Applications that support DDE are MS WORD for WINDOWS as well as MS EXCEL, SUPERBASE, SQL and AMI Professional and many others.
Different from data transfer via the clipboard, DDE represents a direct communication between two applications. Therefore for DDE transfers both applications (ES-K1 as well as e.g. MS WORD) must have been started from Windows.
The advantage of DDE over the clipboard is that data transfers can be automated. This way data transfers and data updates can be done with minimum user effort.
One of the two applications, the so called "client" (e.g. MS WORD) controls the communication. The other application (ES-K1) works as the "server", which on request delivers data to the client application. The ES-K1 transfers these data as pure text, except the graphics which will be delivered in a vector format.

5.1.1 DDE Commands

Generally a DDE command consists of three parts:
Syntax: ***Service* Name *Topic* Name *Item* Name**
The preparation of a DDE transfer is done via the client application through providing of the server application name (ES-K1 in this case), the topic name and the item name. The kind of available data depends on the server application (see chapter 5.3)
The exact Syntax of DDE commands depends on the client application. A detailed description of the command syntax for MS WORD follows.

5.2 DDE with MS WORD for Windows™

DDE enables to use all the presentation functionality in MS WORD for the creation of user defined test reports based on data from the application ES-K1. The automation of this process can be achieved through design of suitable document templates (also see chapter 5.2.2). The WORD ducument then works as the client which controls the transfers.

5.2.1 General Command Syntax with WORD for Windows™

The buildup of a DDE connection from MS WORD is done by making use of the field functions "DDE" and "DDEAuto"
Syntax: **{DDE** *Service Topic Item***}**
{DDEAuto *Service Topic Item***}**

DDE, DDEAuto:	WORD field function for dynamic data transfer
Service:	The service name. Here the name **ES-K1** has to be given.
Topic:	The topic name. Could be e.g. a file type.
Item:	The item name. Should be the name of the data to be transferred.

Example: **{DDE** ES-K1 System Topics**}**
This command lists all topics that are available from the server application ES-K1.
The item name consists of the ES-K1 database name and - if necessary - a subitem name which must be separated from the database name by a '$' character.
First an empty function field must be inserted by pressing **STRG+F9**. The cursor will be positioned between the brackets that work as field indicators. Now a field function DDE or DDEAuto can be entered, along with the required names. Pressing **F9** updates the field. WORD then automatically changes to the display of the field's result, provided that the global settings of the fields allow to do so.
The field function DDEAuto works different from DDE in that the data will be automatically updated, i.e., a change in the ES-K1 file immediately leads to a change in the WORD document.

5.2.2 Creating a Test Report

For creating a test report via DDE it is a good idea to make use of the powerful table and style functions of MS WORD.
In a first step the layout of the report has to be designed in a WORD document or document template. To do so, tables should be assigned to the topics.
In a second step the items and subitems have to be inserted into the rows and columns of the table.
The style of the function fields can be defined as with normal text. So any kind of style (character font and size, etc.) can be used. The style will also be valid for the result of the field after updating. A resulting graphical diagram can be modified like any other graphics in MS WORD.

Example:

{company logo as a bitmap}

{DDE ES-K1 RPH "vol_0001$HDR_HEAD1"}

{DDE ES-K1 RPH "vol_0001$HDT_EUT"} {DDE ES-K1 RPH "vol_0001 $HDR_EUT"}

{DDE ES-K1 RPH "vol_0001$HDT_MANU"} {DDE ES-K1 RPH "vol_0001 $HDR_MANU"}

{DDE ES-K1 RPH "vol_0001$HDT_OP_COND"} {DDE ES-K1 RPH "vol_0001 $HDR_OP_COND"}

{DDE ES-K1 RPH "vol_0001$HDT_OPER"} {DDE ES-K1 RPH "vol_0001 $HDR_OPER"}

{DDE ES-K1 RPH "vol_0001$HDT_TEST_SPEC"} {DDE ES-K1 RPH "vol_0001 $HDR_TEST_SPEC"}

{DDE ES-K1 RPH "vol_0001$HDT_COM1"} {DDE ES-K1 RPH "vol_0001 $HDR_COM1"}

Comment: *If the device under test is used in the operating mode then the supply lines have to fulfill the regulation ABC123 ...*

Start	Stop	Step	IFBW	Detector	Meastime	RF-ATTN	Preampl.
{DDE ES-K1 SCT "EN 55022 Voltage S_START_FREQS1" }	{DDE ES-K1 SCT "EN 55022 Voltage S_STOP_FREQS1"}	{DDE ES-K1 SCT "EN 55022 Voltage S_STEP_FREQS1"}	{DDE ES-K1 SCT "EN 55022 Voltage S_IFBWS1"}	{DDE ES-K1 SCT "EN 55022 Voltage$S_DET_CURVE1 $S1"}	{DDE ES-K1 SCT "EN 55022 Voltage$S_MEASTIME$S 1"}	{DDE ES-K1 SCT "EN 55022 VoltageS_RF_ATTNS1" }	{DDE ES-K1 SCT "EN 55022 VoltageS_PREAMPS1"}

{DDE ES-K1 GRC "vol_0001"}

Measurement Results (QP Detector)

Frequency	Level	Limit	Margin	Exceed	Line	PE
{DDE ES-K1 MES "vol_0001_fin QP$R1C1:R99C 1"}	{DDE ES-K1 MES "vol_0001_ fin QP$R1C2: R99C2"}	{DDE ES-K1 MES "vol_0001_ fin QP$R1C3: R99C3"}	{DDE ES-K1 MES "vol_0001_fin QP$R1C4:R99C 4"}	{DDE ES-K1 MES "vol_0001_ fin QP$R1C5: R99C5"}	{DDE ES-K1 MES "vol_0001_ fin QP$R1C6: R99C6"}	{DDE ES-K1 MES "vol_0001_ fin QP$R1C7: R99C7"}

Result: With updating of the marked function fields the style settings will be used for the resulting elements.Graphics will always be inserted with minimum size (can be streched to desired size). Graphics can then be modified like any other graphics imported e.g. with the clipboard.

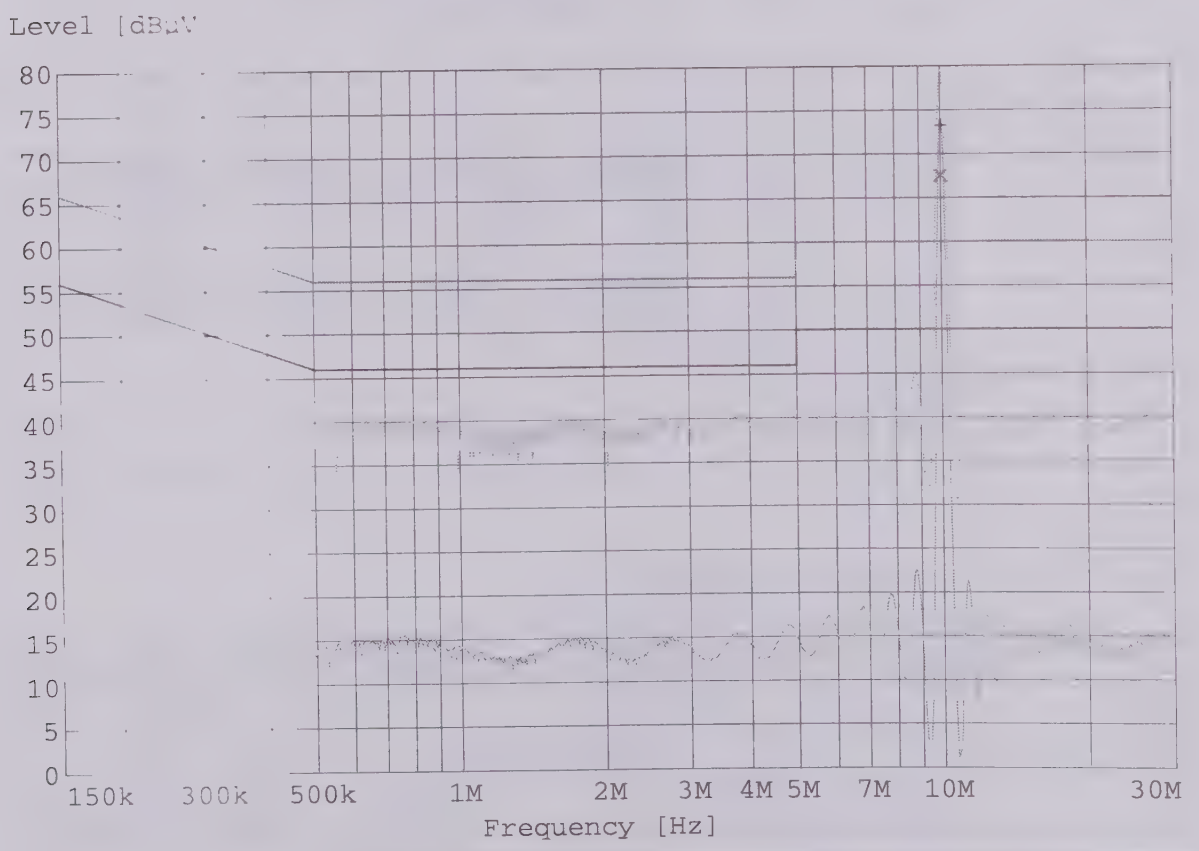
A result of the final example report is shown on the following pages.

ROHDE&SCHWARZ
TEST

EUT	E.u.T.
Manufacturer	
Operating Condition	
Operator	Donald Duck
Test Specification	
Comment	

Comment: *If the device under test is used in the operating mode then the supply lines have to fulfill the regulation ABC123 ...*

Start	Stop	Step	IFBW	Detector	Meastime	RF-ATTN	Preampl.
150.0 kHz	30.0 MHz	6.0 kHz	10 kHz	MaxPeak	10.0 ms	0 dB	Off



x x MESvol_0001_fin QP
\+ + MESvol_0001_fin AV
MESvol_0001_pre PK
MESvol_0001_pre AV
——— LIMEN 55022 V QP
——— LIMEN 55022 V AV

Measurement Results (QP Detector)

Frequency	Level	Limit	Margin	Exceed	Line	PE
9.978000	67.79	60.00	-7.79	*	L3	FLO

Measurement Results (AV Detector)

Frequency	Level	Limit	Margin	Exceed	Line	PE
10.008000	73.49	50.00	-23.49	*	L2	FLO

5.3 DDE Commands of the Application ES-K1

5.3.1 ES-K1 DDE Topics

The following topics are available:

System	general state of the system
MES	measurement result
LIM	limit line
XTP	probe transducer
XTS	system transducer
GRC	graphics configuration
FRL	frequency list
RPH	report header
RPC	report configuration
SCT	scan table
SWT	sweep table

Note: The use of database names or codes for table elements works case sensitive. If a database name holds spaces then the whole item name has to be put between " " characters.

5.3.1.1 General State of the System

If the topic System is used then the DDE connection does not refer to a specific file. It can be used to get general information on the data in the ES-K1.

Topic name: **SYSTEM**

The following items can be retrieved:

Topics lists all available topics in the format <name><tab>

SysItems lists all available items to the current topic in the format <name><tab>

Formats lists all available data formats in the format <name><tab>

Example with MS WORD:

{DDE ES-K1 System Formats}

5.3.1.2 Lists

Topic name:	**MES**	(measurement results)
Topic name:	**LIM**	(limit line)
Topic name:	**XTP**	(probe transducer)
Topic name:	**XTS**	(system transducer)
Topic name:	**FRL**	(frequency list)

The following items can be retrieved:

SysItems lists all available items to the current topic in the format <name><tab>

FileType gives the description of the data type

FileNames gives a list of database names, separated through tabs

SubItems lists all available subitems (commands after *<database name>*$) in the format *<subitem name><tab>*

Database name If no subitem is given after the database name then the whole table will be transferred in the following format:

<text line 1><CR><LF>
<text line 2><CR><LF>
<text line 3><CR><LF>
<text line 4><CR><LF>
<value lines 1...n><CR><LF>
<CR><LF><CR><LF>
<Tab><additional data elements 1...n><CR><LF>

The item name consists of an ES-K1 database name and optionally of a subitem name, separated through a '$' character. No spaces are allowed between database name and subitem name.

The following subitems can be retrieved:

Name delivers the name of the database element
Time delivers the time (last modification) of the database element
Date delivers the date (last modification) of the database element
TabSize delivers the size of the table in the format
R*r*C*c*<*tab*>S*s*
r number of rows (including text lines)
c number of columns
s number of additional (single) values
R[H]*r1***C***c1***:R***rn***C***cn*
delivers a rectangular portion from the table, rows r1 to rn, columns c1 to cn; the columns are separated by <*tab*>, the rows by <*tab*><*linefeed*>
with **R** only the values will be transferred; no text lines will appear
with **RH** the four text lines (description, units, etc.) come before the values
S*s1***:S***sn* delivers additional single values in the format
<*tab*><*description*><*CR*><*LF*>.
s2 delivers the name of the range table (scan/sweep table) in measurement results
Example with MS WORD:
{DDE ES-K1 MES "Example Result$RH1C1:R8C2"}

5.3.1.3 Graphics Configuration

Topic name: **GRC**
The following items can be retrieved:
SysItems lists all available items to the current topic in the format <name><tab>
FileType gives the description of the data type
FileNames gives a list of database names, separated through tabs
SubItems lists all available subitems (commands after <*database name*>**$**) in the format <subitem name><tab>
Database name If no subitem is given after the database name then the whole graphics will be transferred in a vector format.
The item name consists of an ES-K1 database name and optionally of a subitem name, separated through a '$' character. No spaces are allowed between database name and subitem name.
The following subitems can be retrieved:
Name delivers the name of the database element
Time delivers the time (last modification) of the database element
Date delivers the date (last modification) of the database element
Example with MS WORD:
{DDE ES-K1 GRC "Example Graphics"}

5.3.1.4 Report Header

Topic name: **RPH**
The following items can be retrieved:
SysItems lists all available items to the current topic in the format <name><tab>
FileType gives the description of the data type
FileNames gives a list of database names, separated through tabs
SubItems lists all available subitems (commands after <*database name*>**$**) in the format <subitem name><tab>
Database name If no subitem is given after the database name then the whole report header will be transferred in the following format:
<*subitem description*>:<*tab*><*subitem text*>
<*CR*><*LF*>
The item name consists of an ES-K1 database name and optionally of a subitem name, separated through a '$' character. No spaces are allowed between database name and subitem name.
With the subitems those with a name **HDT...** give the description of the referring element, those with a name **HDR...** the text of the element.
The following subitems can be retrieved:
Name delivers the name of the database element

Time delivers the time (last modification) of the database element
Date delivers the date (last modification) of the database element
HDR_HEAD1, HDT_HEAD1
1st top line
HDR_HEAD2, HDT_HEAD2
2nd top line
HDR_EUT, HDT_EUT
description of the E.u.T.
HDR_MANU, HDT_MANU
description of the manufacturer
HDR_OP_COND, HDT_OP_COND
description of the operating conditions
HDR_TEST_SITE, HDT_TEST_SITE
description of the test site
HDR_OPER, HDT_OPER
description of the operator
HDR_TEST_SPEC, HDT_TEST_SPEC
description of the test specification
HDR_COM1, HDT_COM1
1st comment line
HDR_COM2, HDT_COM2
2nd comment line
Example with MS WORD:
{DDE ES-K1 RPH "Example Header$HDT_HEAD1"}

5.3.1.5 Report Configuration

Topic name: **RPC**
The following items can be retrieved:
SysItems lists all available items to the current topic in the format <name><tab>
FileType gives the description of the data type
FileNames gives a list of database names, separated through tabs
SubItems lists all available subitems (commands after *<database name>*$) in the format <subitem name><tab>
Database name If no subitem is given after the database name then the whole report configuration will be transferred in the following format:
<subitem description>:
<tab><subitem text1> <tab>... <tab><subitem-textn>
<CR><LF>
The item name consists of an ES-K1 database name and optionally of a subitem name, separated through a '$' character. No spaces are allowed between database name and subitem name.
The following subitems can be retrieved:
Name delivers the name of the database element
Time delivers the time (last modification) of the database element
Date delivers the date (last modification) of the database element
RPH delivers the database name of the report header that belongs to this report configuration
LIM delivers a list holding the database names (separated by tabs) of the limit lines that belong to this report configuration
MES delivers a list holding the database names (separated by tabs) of the measurement results that belong to this report configuration
SCT delivers a list holding the database names (separated by tabs) of the scan tables that belong to this report configuration
SWT delivers a list holding the database names (separated by tabs) of the sweep tables that belong to this report configuration
XTS delivers a list holding the database names (separated by tabs) of the system transducers that belong to this report configuration
XTP delivers a list holding the database names (separated by tabs) of the probe transducers that belong to this report configuration

GRC delivers a list holding the database names (separated by tabs) of the graphics configurations that belong to this report configuration
REP_FOOTNOTE delivers the setting of the report footnote that belongs to this report configuration
REP_FTNOTETXT delivers the report footnote text that belongs to this report configuration
REP_PICTURE delivers the setting of the graphics output (full or half)
Example with MS WORD:
{DDE ES-K1 RPC "Example Report"}

5.3.1.6 Scan/Sweep Table

Topic name: **SCT** (scan table)
Topic name: **SWT** (sweep table)
The following items can be retrieved:
SysItems lists all available items to the current topic in the format <name><tab>
FileType gives the description of the data type
FileNames gives a list of database names, separated through tabs
SubItems lists all available subitems (commands after *<database name>***$**) in the format *<subitem name><tab>*
Database name If no subitem is given after the database name then the whole table will be transferred in the following format:
S*s***:***<subitem description>***:** *<tab><subitem text>*
<CR><LF>
s: number of the range; range 0 is used for elements that are not dependent on the ranges
The item name consists of an ES-K1 database name and optionally of a subitem name, separated through a '$' character. No spaces are allowed between database name and subitem name.
To retrieve the single values of a scan/sweep table the subitem name will be extended through a subrange description, separated through a '$' character.
A subrange can be defined either through an index or through the frequency:
S*s* selection of the subrange through an index
s index
F*f* selection of the subrange through a frequency
f frequency in *Hz.*
K*f* frequency in *kHz.*
M*f* frequency in.*MHz.*
G*f* frequency in.*GHz.*
A subrange with index 0 is used for elements that are not dependent on the subranges. If the surange information is not given although the value of the item depends on the subrange, then an item will be transferred for all subranges. Single elements are transferred in the following format:
<tab><subitem value>
In all other cases the format is as follows:
S*s*:*<subitem description>*:*<tab><subitem value><CR><LF>*
The following subitems can be retrieved:
Name delivers the name of the database element
Time delivers the time (last modification) of the database element
Date delivers the date (last modification) of the database element
ALL<s> delivers all elements of a subrange in the following format:
S*s*: *<subitem description>*:*<tab><subitem value>*
<CR><LF>.

Subitems that are valid for all subranges:
S_COUNT_SUB delivers the number of subranges

Example with MS WORD:

{DDE ES-K1 SCT "Example Scan TableALLS1"}
delivers all elements of the 1st subrange
{DDE ES-K1 SCT " Example Scan Table $S_UNIT"}
delivers the level unit of the scan table
{DDE ES-K1 SCT " Example Scan Table $S_START_FREQ"}
delivers the start frequency for each of the subranges
{DDE ES-K1 SCT " Example Scan Table S_START_FREQS2"}
delivers the start frequency of the 2nd subrange

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